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**Timber, Cooperative
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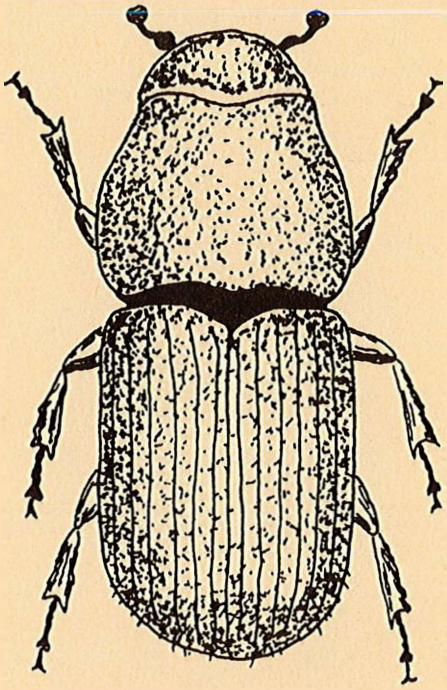
BARK BEETLE CONDITIONS NORTHERN REGION 1989



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Report 90-9

May 1990

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NORTHERN REGION
1989

by

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NORTHERN REGION
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INTRODUCTION

For the third consecutive year, we have chosen to report the status of bark beetle conditions generally. Following a pattern established in 1988 (Gibson and Oakes 1988, 1989), we continue to discuss the impacts bark beetles of several species are having on stands throughout the Northern Region. Much of the data collected, and therefore, much of our knowledge of bark beetle status, is derived from annual aerial surveys. To the extent possible, we conduct ground surveys in infested areas to determine population trend and measure damage which has occurred or may yet take place in those stands.

This report includes data relative to bark beetle infestations on lands of all ownerships throughout the Region. Where those data are derived solely from aerial surveys, we have so indicated. Where ground-collected data are available, it is likewise included and noted. While we are fully aware of the limits on the usefulness of aerial survey estimates--being essentially a year old when collected--they are still invaluable in tracking and recording a history of insect outbreaks. The applicability of ground data, though inherently more accurate and timely, is likewise limited. Available time and personnel preclude us from evaluating every infested area as extensively as we would like. While those data fairly accurately portray beetle status in the areas from which they are collected, they do not necessarily indicate that that same intensity of infestation is represented throughout the infested area. Rather, those data should suggest damage levels which are plausible in stands of similar conditions.

MOUNTAIN PINE BEETLE

For the eighth consecutive year, areas infested by mountain pine beetle (MPB) declined Region-wide. In 1989, slightly more than 436,500 acres showed some level of infestation (Tables 1 and 2). In 1988, beetle-killed trees were recorded on nearly 560,000 acres. The largest decreases were in the lodgepole pine type--declining from 534,000 acres in 1988 to about 395,000 acres in 1989. Most of those infested acres were recorded in Montana, on the Kootenai, Flathead, and Lolo National Forests (NF).

Ponderosa pine stands infested by MPB showed a slight increase in 1989. Just over 38,700 acres contained beetle-caused mortality, compared to 23,900 acres in 1988. Inasmuch as trees recorded on aerial surveys are those killed the previous year, actual increases occurred in 1988. Ground surveys, conducted in fall 1989, indicated a decrease in attacked trees occurred in most areas of western Montana during the most recent attack period. Of the total infested acres, approximately 6,700 were in north Idaho. In some areas of north Idaho--particularly areas adjacent to the Salmon River--drier-than-normal weather is continuing. Some stands in that part of the State are experiencing static to slightly increasing MPB populations.

MPB in other host species, notably white bark, western white, and limber pines, showed moderate increases in 1989. Though total infested acres were higher on some Forests, beetle populations in most stands remained at essentially endemic levels.

Following is a description of beetle status as recorded by reporting area:

Beaverhead National Forest

Though at one time harboring some of the more severe MPB outbreaks in the Region, few beetle-killed lodgepole pine have been observed on the Forest in the past several years. In 1989, however, a total infested area of nearly 600 acres was recorded (Tables 1 and 2). Most were in two areas, each of about 200 acres,

Table 1.--Acres under Federal jurisdiction in the Northern Region on which mountain pine beetle-caused mortality was aerially observed, 1988 and 1989.

	- - - 1988 - - -				- - - 1989 - - -			
Area	LPP[1]	PP	WBP	WWP	LPP	PP	WBP	WWP
Beaverhead NF	6	-	-	-	417	-	8	-
Bitterroot NF	1,588	2,402	1	-	59	3,397	-	-
Clearwater NF	-	-	-	1	-	264	-	-
Custer NF	-	2	-	-	13	18	-	-
Deerlodge NF	1,478	5	-	-	2,472	56	63	-
Flathead NF	92,778	39	98	104	57,375	19	799	254
Gallatin NF	*	*	*	*	89	-	-	-
Helena NF	1	8	-	-	5	8	78	-
IPNF's	757	9	6	9	500	110	1	3
Kootenai	304,785	6,306	21	458	248,033	10,636	327	484
Lewis & Clark NF	1	179	-	-	46	98	-	-
Lolo NF	28,051	813	3	84	26,698	2,607	634	2
Nez Perce NF	2,341	271	-	-	803	-	-	-
Total NF	**431,785**	**10,034**	**129**	**656**	**336,510**	**17,213**	**1,910**	**743**
Glacier NP	*	*	*	*	1,085	-	-	52
Yellowstone NP	*	*	*	*	*	*	*	*
Blackfeet IR	*	*	*	*	*	*	*	*
Crow IR	-	3,635	-	-	-	1,228	-	-
Flathead IR	1,429	47	5	2	905	533	-	-
Ft. Belknap IR	*	*	*	*	-	1	-	-
N. Cheyenne IR	-	19	-	-	-	-	-	-
Rocky Boy's IR	*	*	*	*	4	1	-	-
BLM (Total)	1,037	293	1	-	77	96	3	1
Total (Non-NF)	**2,466**	**3,994**	**6**	**2**	**2,071**	**1,879**	**3**	**1**
Total Federal	**434,251**	**14,028**	**135**	**658**	**338,581**	**19,092**	**1,913**	**744**

[1] LPP = Lodgepole pine, PP = ponderosa pine; WBP = whitebark pine; WWP = western white pine
* Not flown

Table 2.--Acres of State and private ownership in the Northern Region on which mountain pine beetle-caused mortality was aerially observed, 1988 and 1989.

	- - - 1988 - - -				- - - 1989 - - -			
Area	LPP[1]	PP	WBP	WWP	LPP	PP	WBP	WWP
Beaverhead NF	3	-	-	-	152	1	2	-
Bitterroot NF	-	4,243	-	-	2	8,849	-	-
Clearwater NF	-	-	-	-	-	-	-	-
Custer NF	-	-	-	-	1	-	-	-
Deerlodge NF	147	4	-	-	35	4	-	-
Flathead NF	13,643	2,088	-	4	4,429	42	-	60
Gallatin NF	*	*	*	*	80	-	1	-
Helena NF	1	18	-	-	41	165	-	-
IPNF's	-	-	2	-	1	-	-	-
Kootenai NF	34,276	1,705	-	7	17,608	1,860	-	7
Lewis & Clark NF	-	425	-	-	6	722	-	-
Lolo NF	10,092	331	2	1	5,356	1,237	-	-
Nez Perce NF	226	1	-	-	10	-	-	-
Stillwater SF	28,337	1	1	21	18,137	1	-	5
Swan River SF	235	-	-	10	-	-	-	2
Thompson River SF	5,921	391	-	-	3,181	314	-	-
Garnets	7	641	-	-	1	551	-	-
Cataldo FPD	246	68	-	-	75	1	-	-
CLW/Potlatch FPD	-	1	-	-	-	-	-	1
Pend Orielle SF	-	-	-	-	1	932	-	-
Mica FPD	179	2	-	-	21	-	-	-
W. St. Joe FPD	-	-	-	-	-	-	-	-
Craig Mountains	6,025	36	-	-	7,258	4,970	-	-
Maggie Creek FPD	-	1	-	-	-	-	-	135
Total	**99,338**	**9,956**	**5**	**43**	**56,395**	**19,649**	**3**	**210**

[1] LPP = Lodgepole pine, PP = ponderosa pine; WBP = whitebark pine; WWP = western white pine
* Not flown in 1988

in the Indian Creek drainage south and east of Ennis. The remainder of the faded trees were located in small 2- to 10-tree groups, scattered throughout the lodgepole pine type on the Madison Ranger District (RD).

A cluster of six 5- to 10-tree fader groups, covering approximately 500 acres, was seen near Van Houten Lake Campground, southwest of Jackson. Spring (1990) surveys indicated most of those were actually killed by secondary bark beetles.

Bitterroot National Forest

Second-growth ponderosa pine stands within the Bitterroot NF reporting area--both Federal lands and those in State and private ownership--containing beetle-killed trees increased significantly in 1989. On National Forest Service (NFS) lands, affected acres increased by 50 percent--from 2,400 acres in 1988 to 3,400 acres in 1989. On State and private lands, the figure more than doubled--from 4,200 acres to 8,800 acres (Tables 1 and 2). Most of the areas in which we located ground plots showed a decline in 1989-attacked trees (Table 3). Those data suggest the actual increase in beetle-caused mortality occurred in 1988. MPB populations appear to be declining at the present time. Still, large areas of beetle-killed trees can be found in the area of French Basin ands nearby stands on the Sula RD. Other infested stands are found in low-elevation second-growth ponderosa pine stands on the west side of the Bitterroot Valley from the confluence of the East and West Forks on the Bitterroot River, north nearly to Lolo Creek. Most are located on private land (Appendix, Figure 1).

The infestation in lodgepole on the West Fork RD, near Dennis Mountain, declined markedly. In 1989, only widely scattered groups of 5- to 20-faded trees, about 60 acres, were observed. That infestation had covered nearly 1,600 acres in 1988.

A pilot project conducted on State and private land in French Basin attempted to test the effectiveness of verbenone (MPB anti-aggregative pheromone) in protecting susceptible ponderosa pine stands from beetle attack. Those data are being analyzed, however, MPB population declined to such an extent in 1989 that treatment effects may be difficult to assess.

Table 3.--Acres infested and trees per acre killed by mountain pine beetle, Bitterroot reporting area, 1988 and 1989.

	- - - Acres infested [1] - - -			- - - Average no. trees/acre killed[2] - - -			
Ownership	Host	1988	1989	Older	1988	1989	To date
Darby RD	LPP PP	0 1,612	42 2,357	- 49.7	- 47.4	- 11.4	- 108.5
Stevensville RD	LPP PP	0 150	0 24	-	-	-	-
Sula RD	LPP PP	0 512	0 925	-	-	-	-
West Fork RD	LPP PP	1,588 3	17 91	0 23.2	14.1 53.3	0 4.7	14.1 81.2
State, private Other	LPP PP	0 4,243	2 8,849	-	-	-	-
Total/weighted average		8,150	12,307	40.9	49.3	9.2	99.4

[1] Aerial survey estimates

[2] Ground survey data (averaged from number of stands visited)

Clearwater National Forest

For the first time in several years, MPB-killed ponderosa pines were observed on the Clearwater NF in 1989. An estimated 100 trees, in an area totalling 260 acres, were noted on NFS land administered by the Palouse RD, south of Elk River. We have not visited that site on the ground, so cannot comment on the potential for spread of that infestation.

Custer National Forest

MPB populations on the Custer NF are found at essentially endemic levels. In the Ekalaka Hills, Sioux RD, several groups of faded ponderosa pines--totally 185 trees--were observed. Though recorded as killed by MPB, we ground checked a few of those groups and found the beetle killing at least some trees to be an engraver beetle, *Ips calligraphus*. The infestation potential for MPB does appear to be high in many of those stands, however.

On the Beartooth RD, a few scattered groups of lodgepole pine were recorded as having been killed by MPB in the Pryor Mountains southeast of Bridger. Susceptible lodgepole pine stands are found on other portions of the District as well, particularly west of Red Lodge in Red Lodge Creek and Lodgepole Creek drainages.

Deerlodge National Forest

Forest-wide, there was a slight increase in estimated acres containing beetle-killed lodgepole pines. Infested area on the Jefferson RD showed the most significant increase--up from 1,440 acres in 1988 to 2,380 in 1989. Much of that increase was recorded as scattered groups of faders on the eastern portion of the District, just west of the Boulder River (Appendix, Figure 2).

Though some infested areas near Delmoe Lake appeared as larger polygons on the 1989 aerial survey sketch maps--reflecting trees attacked in 1988--ground data collected in 1989 suggest that infestation is declining rapidly. Data showed an average 28 new attacks per acre in 1988 compared to less than one per acre in 1989 (Table 4).

In 1989, we conducted a pilot test to measure the efficacy of two pyrethroid insecticides, at various concentrations, as preventive treatments against MPB attack in lodgepole pine. One of the insecticides, cyfluthrin, proved to be very effective. Test results will be published later this year. As part of that test, we baited all treated and "control" trees with MPB tree baits. In all, we baited 240 trees in the area from Homestake Lake to Delmoe Lake. While most baited trees were attacked by MPB, very few were heavily attacked over most of the bole. At nearly all sites, the baited trees were the only trees attacked. Those data are additional indications of declining beetle populations.

Table 4.--Acres of lodgepole pine infested and trees per acre killed by mountain pine beetle, Deerlodge reporting area, 1988 and 1989.

	- - - Acres infested - - -		- - - Average no. trees/acre killed - - -			
Ownership	1988	1989	Older	1988	1989	To date
Butte RD	25	17	0	35.6	0	35.6
Deerlodge RD	7	75	-	-	-	-
Jefferson RD	1,442	2,378	26.9	27.8	0.5	55.2
Philipsburg RD	4	2	-	-	-	-
State, private, other	147	39	-	-	-	-
Total/weighted avg.	1,625	2,511	24.0	28.6	0.4	53.0

Flathead National Forest

Areas and intensities of infestation throughout the Flathead reporting area continued their marked decline in 1989. In 1988, nearly 110,000 acres were still infested. Last year, just fewer than 63,000 acres on all ownerships and in all species were infested. While small increases in infested acres were recorded in the Glacier View and Swan Lake RD's, significant decreases continued on the Hungry Horse and Tally Lake RD's. Decreases were also noted on State and private lands within the reporting area (Appendix, Figure 3).

Likewise, ground-collected data showed declining trends Forest-wide. In those areas surveyed, an average 39 trees per acre had been killed in 1988 and only 3.5 trees per acre were successfully attacked in 1989 (Table 5). Evaluations conducted with District personnel on the Glacier View RD in November showed an increase in numbers of beetle-killed western white pine. While the infestations are not expansive, mortality in old growth white pines--attributable to a combination of MPB, blister rust, drought, and winter drying--in the Crystal, Kimmerly, Depuy and McGinnis Creek drainages--is significant.

We expect beetle populations to continue to decline in 1990.

Table 5.--Acres of host infested and lodgepole pine per acre killed by mountain pine beetle, Flathead reporting area, 1988 and 1989.

	- - - Acres infested - - -			- - - Average no. trees/acre killed - - -			
Ownership	Host	1988	1989	Older	1988	1989	To date
Glacier View RD	LPP	12,964	19,068	17.6	38.8	5.5	61.9
	PP	0	16	-	-	-	-
	WBP	59	793	-	-	-	-
	WWP	6	42	-	-	-	-
Hungry Horse RD	LPP	15,298	8,917	22.3	37.1	4.9	64.3
	PP	1	0	-	-	-	-
	WBP	27	6	-	-	-	-
	WWP	55	197	-	-	-	-
Spotted Bear RD	LPP	68	156				
	WBP	11	0	-	-	-	-
	WWP	4	3				
Swan Lake RD	LPP	2,818	4,526	45.5	11.7	0	57.2
	PP	2	2	-	-	-	-
	WBP	1	0	-	-	-	-
	WWP	29	12	-	-	-	-
Tally Lake RD	LPP	61,630	24,708	53.0	70.7	1.0	124.7
	PP	36	1	-	-	-	-
	WWP	10	0	-	-	-	-
State, private, other	LPP	14,673	4,429	-	-	-	-
	PP	2,124	42	-	-	-	-
	WWP	5	61	-	-	-	-
Total/weighted avg. (LPP)		109,821	62,979	30.7	39.2	3.5	73.4

Gallatin National Forest

Only the western portion of the Gallatin NF was flown in 1989. Because of the extensive fires in and around Yellowstone National Park (NP), none of the Forest was surveyed in 1988. Last year, several small groups of lodgepole pine faders were noted on the northern portion of Hebgen Lake RD and southern part of Bozeman RD. Expanding in total area to only a few square miles, beetle-killed trees were located north and west of the northwest corner of Yellowstone NP--mostly west of Grouse Mountain. Total infested area was estimated at 169 acres, on both FS and private land (Tables I and 2). We believe these to be nothing more than endemic populations, but will monitor them closely.

Helena National Forest

MPB populations on the Helena NF and surrounding State and private lands remained essentially endemic in 1989. While some increase in beetle-killed ponderosa pine was noted, most remained in small, widely scattered groups of 5 to 10 trees north and east of Helena (Table 6).

Much of what was recorded as MPB-killed lodgepole pine on the Townsend RD, near Deep Creek Campground, was actually the result of secondary bark beetle attacks. Such infestations are not uncommon following MPB outbreaks, or as a consequence of dry weather.

The expansive damage to lodgepole pine stands, caused by winter desiccation along the Continental Divide west of Helena, covered nearly 280,000 acres on the Helena NF reporting area alone. Though we will not know for several years how much of that damage resulted in tree mortality, many trees apparently were killed (Klein 1990). At this time, we do not believe this damage will result in increased MPB populations. Some local and short-lived outbreaks of secondary beetles are possible. Followup surveys over the next couple of years will ascertain to what extent additional tree mortality and beetle infestations occur.

Table 6.--Acres infested by mountain pine beetle, Helena reporting area, 1988 and 1989.

	- - - 1988 - - -			- - - 1989 - - -		
Ownership	LPP	PP	WBP	LPP	PP	WBP
Helena RD	1	4	0	3	5	0
Lincoln RD	0	3	0	1	1	0
Townsend RD	0	1	0	1	2	78
State, private, other	1	20	0	41	168	0
Total	2	28	0	46	176	78

Idaho Panhandle National Forests

With the exception of modest increases in MPB-killed ponderosa pine, areas infested by MPB on the Forest declined in 1989. Infested lodgepole pine stands in the Boulder Creek drainage, Bonners Ferry RD, declined from 500 acres in 1988 to less than 200 acres in 1989. Acres of lodgepole pine affected by MPB remained static on the Fernan RD and increased only slightly on the Wallace RD (Table 7).

Stand data suggest approximately 33,000 acres of high-risk lodgepole pine yet exist on the Forest. Another 70,000 acres will grow into a susceptible size and age class in the next 10-20 years. MPB populations have remained low on the Forest because of a lack of widespread susceptibility and aggressive management to reduce stand hazard. As stands become more conducive to population increases, continued diligence will be required.

Table 7.--Acres infested by mountain pine beetle, Idaho Panhandle reporting area, 1988 and 1989.

	--- 1988 ---				--- 1989 ---			
Ownership	WWP	LPP	PP	WBP	WWP	LPP	PP	WBP
Bonners Ferry RD	1	501	1	0	0	177	0	0
Fernan RD	0	100	1	0	2	120	2	0
Priest Lake RD	3	3	0	0	0	0	50	0
Sandpoint RD	0	40	7	2	1	9	57	1
St. Maries RD	3	0	0	2	0	0	0	0
Wallace RD	0	113	0	1	0	190	0	0
Avery RD	2	0	0	0	0	4	1	0
State, private, other	1	0	0	2	0	1	0	0
Total	10	757	9	7	3	501	110	1

Kootenai National Forest

Though the Kootenai NF reporting area (all ownerships, all affected species) contains the majority of the MPB-infested lands in the Region, those infestations too are declining noticeably. Nearly two-thirds (64 percent) of the MPB infestations overall and of the infested lodgepole pine (67 percent), are found on the Kootenai. Still, infested area decreased by nearly 70,000 acres Forest-wide in 1989. Largest declines were noted on the Cabinet, Fisher River, and Libby RD's and on State and private lands. Rexford RD remained static. At nearly 112,000 acres, it is the most heavily infested area on the Forest. Three Rivers RD, particularly in the upper Yaak River drainage, showed a slight increase in infested area (Appendix, Figure 4).

Throughout the infested areas on the Forest, we collected data from 153 variable-radius plots. With the exception of the Libby RD, where infestation level declined only slightly, significant decreases in numbers of attacked trees were noted in 1989 (Table 8). Forest average showed 18.6 new attacks per acre in 1989, compared to 50.3 per acre in 1988. As beetles continue to kill susceptible trees, albeit at a declining rate; and as stand susceptibility is altered through silvicultural means, where possible, the declining trend in beetle-caused mortality should continue. Our data indicate an average 146 green lodgepole pine per acre, over 5 inches dbh, for the areas surveyed. In those areas, lodgepole pine comprised 51 percent of the stand and averaged 7.8 inches dbh. Those data also suggest a continued declining trend.

Table 8.--Acres infested and trees per acre killed by mountain pine beetle, Kootenai reporting area, 1988 and 1989.

	- - - Acres infested - - -			- - - Average no. trees/acre killed - - -			
Ownership	Host	1988	1989	Older	1988	1989	To date
Cabinet RD	LPP PP WBP WWP	2,083 5 1 24	445 13 1 1	-	-	-	-
Fisher River RD	LPP PP WWP	46,667 3,723 3	20,845 4,870 17	122.7 - -	41.0 - -	0 - -	163.6 - -
Fortine RD	LPP PP WBP WWP	68,376 136 1 0	62,579 469 174 395	29.0 - - -	69.5 - - -	31.0 - - -	129.5 - - -
Libby RD	LPP PP WBP WWP	57,203 2,023 20 82	30,004 2,628 27 12	47.8 - - -	27.7 - - -	27.4 - - -	102.9 - - -
Rexford RD	LPP PP WWP	111,760 415 41	111,910 2,604 20	57.9 - -	59.5 - -	13.9 - -	131.3 - -
Three Rivers RD (Troy)	LPP PP WBP WWF	6,705 4 0 10	6,291 51 125 31	-	-	-	-
Three Rivers RD (Yaak)	LPP PP WWP	11,991 0 297	15,959 1 8	30.3 - -	25.8 - -	16.7 - -	72.8 - -
State, private, other	LPP PP WWP	34,276 1.705 7	17,608 1,860 7	-	-	-	-
Total/weighted avg.	LPP PP	339,061 8,011	265,641 12,496	49.6 -	50.3 -	18.6 -	118.5 -
Species total		347,558	278,137				

Lewis and Clark National Forest

While slight increases in infested areas, in both lodgepole and ponderosa pines, were recorded in 1989, most fader groups were small and scattered. Total area infested increased to 906 acres of ponderosa pine and 54 acres lodgepole pine (Table 9). Most of the lodgepole pine faders were observed south and west of Jumping Creek Campground in the Little Belt Mountains, Judith RD. Pondersoa pine mortality occurred in scattered, 15 to 20 tree groups in the Judith, Little Snowy, and Big Snowy Mountains. Major outbreaks are not anticipated.

Table 9.--Acres infested by mountain pine beetle Lewis & Clark reporting area, 1988 and 1989.

	- - - 1988 - - -		- - - 1989 - - -	
Ownership	LPP	PP	LPP	PP
Judith RD	0	107	39	59
Kings Hill RD	0	1	4	23
Musselshell RD	1	71	3	16
BLM	0	187	2	86
State & private	0	425	6	722
Total	1	791	54	906

Lolo National Forest

Some of the more active infestations in the Region are found on the Plains/Thompson Falls RD. Though new attacks in 1989 were slightly fewer than in 1988, ground plots in lodgepole pine stands in McGinnis Creek and Little Thompson River drainages averaged almost 20 successfully attacked trees per acre (Table 10). Ponderosa pine stands surveyed on the District were less severely impacted.

On the Ninemile RD, plot data showed a small decline in 1989 attacks in lodgepole pine stands and an increase in ponderosa pine. Data collected on the Superior RD, north and east of St. Regis, showed modest increases in infestation intensity in both tree species.

Forestwide, infestation extent decreased from 39,300 acres in 1988 to 36,500 acres in 1989 (Tables 1 and 2 and Appendix, Figures 5 and 6). Seventy-nine ground plots in lodgepole pine stands and 85 in ponderosa pine showed for those areas sampled, there was a nearly static MPB population trend in lodgepole pine and a 30 percent reduction in ponderosa pine (Table 10). Green stand data collected during ground surveys indicate the potential for population levels to remain at about 1989 levels in 1990. Whether that prediction is realized will be determined by weather between now and beetle flight and to what extent susceptible stand conditions are altered silviculturally.

Last year, we conducted a pilot project on the Plains/Thompson Falls RD--as part of a larger, West-wide effort--to test the effectiveness of verbenone (MPB anti-aggregative pheromone) in protecting susceptible lodgepole pine stands from beetle attack. While treatment efficacy has not yet been fully analyzed, we did encounter heavy beetle attacks in some blocks in the Hinchwood Creek drainage. A report detailing project results is in preparation.

Ponderosa pine stands in the Garnet Mountains remained lightly infested by MPB in 1989. Infestation extent declined from 640 acres to 550 acres (Table 2). Most mortality observed was in small, scattered groups in drainages surrounding the Camas Prairie near Potomac. Other mortality was noted in dispersed groups along the Clark Fork River from Bonner east to Bearmouth.

Table 10.--Acres infested and trees per acre killed by mountain pine beetle, Lolo reporting area, 1988 and 1989.

	- - - Acres infested - - -			- - - Average no. trees/acre killed - - -			
Ownership	Host	1988	1989	Older	1988	1989	To date
Missoula RD	LPP	0	3	-	-	-	-
	PP	24	50	0.9	5.6	0	6.5
	WBP	0	0	-	-	-	-
Ninemile RD	LPP	1,924	1,727	7.2	11.1	9.5	27.8
	PP	315	438	14.6	17.7	24.2	56.5
	WWP	0	0	-	-	-	-
Plains RD	LPP	20,733	19,822	23.4	23.7	19.8	66.9
	PP	54	229	1.9	7.4	1.8	11.1
	WBP	0	634	-	-	-	-
	WWP	0	0	-	-	-	-
Seeley Lake RD	LPP	2	0				
	PP	1	1	-	-	-	-
	WBP	0	0				
Superior RD	LPP	1,422	576	1.5	11.9	19.5	32.9
	PP	355	1,833	7.2	7.6	12.0	26.8
	WBP	0	0	-	-	-	-
	WWP	81	1	-	-	-	-
Thompson Falls RD	LPP	3,970	4,570				
	PP	84	56				
	WBP	3	0	-	-	-	-
	WWP	3	1				
Garnet Mtns.	LPP	641	2				
	PP	7	554	-	-	-	-
State, private, other	LPP	10,092	5,356	42.8	51.1	42.4	136.3
	PP	332	1,237	15.7	29.1	9.5	54.3
	WBP	2	0	-	-	-	-
	WWP	1	0	-	-	-	-
Total/weighted avg.	LPP	38,784	32,056	18.0	22.5	21.4	61.9
	PP	1,152	4,398	10.0	16.2	10.7	36.9
Species total		40,026	36,454				

Nez Perce National Forest

MPB populations on the Nez Perce NF continued their marked decline. In 1988, infested area dropped to 2,500 acres from almost 7,500 acres in 1987. In 1989, the area on which beetle-killed trees was observed declined to 813 acres (Table 11). What remains of the infestation is found as mostly small groups of 10 to 100 trees in the Red River and South Fork of the Red River drainages (Appendix, Figure 7). Aggressive salvage and stand hazard reduction on the Forest, and particularly the Red River RD, has been primarily responsible for the rapid reduction of beetle populations.

Table 11.--Acres infested and trees per acre killed by mountain pine beetle, Nez Perce reporting area, 1988 and 1989.

	- - - Acres infested - - -			- - - Average no. trees/acre killed - - -			
Ownership	Host	1988	1989	Older	1988	1989	To date
Clearwater RD	LPP PP	1 103	0 0	- -	- -	- -	- -
Elk City RD	LPP	87	3				
Red River RD	LPP PP WBP	2,252 0 0	800 0 0	32.8 - -	19.5 - -	5.7 - -	58.0 - -
Salmon River RD	LPP PP WBP	1 168 0	0 0 0	-	-	-	-
Selway RD	PP WWP	0 0	0 0	-	-	-	-
State, private, other	LPP PP	226 57	10 0	-	-	-	-
Total/weighted avg.	LPP	2,567	813	32.8	19.5	5.7	58.0
Species total		2,895	813				

Yellowstone and Glacier National Parks

Only the northern half of Yellowstone NP was flown in 1989. In that area, no MPB-caused mortality in either limber or lodgepole pine was observed. Virtually no infestations in lodgepole pine have been recorded in the past several years. A small infestation in limber pine near Mammoth has declined to an endemic state. During several ground surveys in lodgepole pine stands weakened by the fires of 1988, only minor amounts of secondary beetles were noted. No MPB have been attracted to weakened lodgepole pine.

Remnant populations of MPB can still be found in the southern portion of Glacier NP. Several large groups of faded lodgepole pines were observed between Huckleberry Mountain and Lake McDonald. Much smaller and more scattered groups were recorded north of the Middle Fork of the Flathead River, east of Park Headquarters. In total, just over 1,000 acres contained some level of infestation (Table 1). We believe these infestations are continuing to decline.

Montana Indian Reservations

In the eastern part of the State, only the Crow Indian Reservation (IR) has significant amounts of beetle-caused mortality in second-growth ponderosa pine stands (Appendix, Figure 8). There, infested acres were reduced by two-thirds in 1989 from 1988 levels. Only 1,228 acres were recorded last year. Ground surveys showed a decline from 25 new attacks per acre in 1988 to only 3 per acre in 1989 (Table 12). Most of the remaining infested stands are in the Corral Creek drainage. Other, small groups of faders were observed south of these--principally in Cache Creek, Owl Creek, and Bear Creek.

No infested stands were recorded on the Northern Cheyenne IR. Infestations of a few years ago in the Busby Creek and Dry Creek drainages, south of Busby, have declined to endemic status as a result of salvage/ sanitation logging and natural decline.

Almost no beetle-killed trees were observed on other Reservations flown (Table 2). No ground surveys were conducted. The Blackfeet IR was not flown, but no infestations of significance are known to exist there.

On the Flathead IR, in western Montana, MPB infestations are still found, though at relatively low levels. Infested acres of lodgepole pine declined from 1,429 in 1988 to only 905 in 1989. Most is concentrated in the northwest corner of the Reservation, south of Bassoo Peak and near Hot Springs. Lesser amounts were noted south and east of Yellow Bay (Appendix, Figure 9). Ground-collected data indicated a decline in infestation rate from 47 trees per acre in 1988 to 8 trees per acre in 1989 (Table 13). Infested ponderosa pines, while having increased in total area to more than 500 acres, are in small, widely scattered groups throughout the ponderosa pine type. Improved moisture conditions should result in further decreases of MPB-caused mortality.

Table 12.--Acres infested and trees per acre killed by mountain pine beetle on Indian Reservations in eastern Montana, 1988 and 1989.

	- - - Acres infested - - -			- - - Average no. trees/acre killed - - -			
Ownership	Host	1988	1989	Older	1988	1989	To date
Blackfeet	LPP	*	*	-	-	-	-
Crow	PP	3,635	1,228	38.7	24.8	3.2	66.7
Ft. Belknap	PP	*	1	-	-	-	-
N. Cheyenne	PP	19	0	-	-	-	-
Rocky Boy's	LPP PP	*	4 1	-	-	-	-

Table 13.--Acres infested and trees per acre killed by mountain pine beetle, Flathead Indian Reservation, 1988 and 1989.

	- - - Acres infested - - -		- - - Average no. trees/acre killed - - -			
Host	1988	1989	Older	1988	1989	To date
LPP	1,429	905	42.5	46.8	7.9	97.3
PP	47	553	-	-	-	-
WBP	5	0	-	-	-	-
WWP	2	0	-	-	-	-
Total	1,483	1,458	42.5	46.8	7.9	97.3

Stillwater, Swan River, and Thompson River State Forests (Montana)

As has been the case with MPB infestations Region-wide, those on the Stillwater, Swan River, and Thompson River State Forests (SF) declined in 1989. The Stillwater SF showed the most dramatic decrease--down from 28,300 acres in 1988 to 18,100 last year (Table 2). As susceptible host stands are depleted, either through beetle activity or harvesting, infestation extent should decline further.

Infested lodgepole pine stands on the Thompson River SF declined in area by nearly half--from 5,900 acres to less than 3,200 acres (Table 2). The bulk of the infested area remains in the southern portion of the Thompson River drainage. Infestations in ponderosa pine stands remained at essentially the same level--slightly more than 300 acres total.

Virtually no MPB-caused mortality was observed in the Swan River SF in 1989. A few western white pines had been killed on a total of 2 acres. No lodgepole pine mortality was observed (Table 2).

Craig Mountains (Idaho)

Aerial survey estimates of acres of host stands affected by MPB increased substantially in 1989. Particular expansion was noted in ponderosa pine stands--up from 36 acres the previous year, to nearly 5,000 in 1989 (Table 2). We believe, however, the increase may be more perceived than real. Mortality is so widely scattered that infestation intensity is less than one tree per acre. For the past several years, most fader groups have been observed in the vicinity of Soldier Meadows Reservoir. In 1989, much of the ponderosa pine mortality was observed in lower elevation stands near Winchester and Cottonwood. Some of those sites have had little of the drought relief experienced in the northern part of the State. Trees there may be under attack by a complex of bark beetles, including MPB, western pine beetle, and pine engravers.

Mortality in lodgepole pine stands also increased in 1989--up from 6,025 acres the previous year to 7,258 acres (Table 2). We do not believe there has been a major increase in beetle activity, however.

Cataldo, Clearwater/Potlatch, Mica, Maggie Creek and West St. Joe Fire Protection Districts and Pend Orielle State Forest (Idaho)

Except for two areas of ponderosa pine faders totaling 930 acres (an estimated 300 dead trees), between Sandpoint and Spirit Lake (Pend Orielle SF), very little MPB-caused mortality was observed in these reporting areas in 1989. Approximately 75 total acres of lodgepole faders were recorded south of Frost Mountain on the Cataldo reporting area. Another 21 acres of dead lodgepole pine, in two small groups, was observed east of Rathdrum on the Mica FPD (Table 2). On the Maggie Creek FPD, near Woodrat Mountain, east of Kamiah, a group of western white pines--estimated at 250 trees--was killed by MPB.

DOUGLAS-FIR BEETLE

In large part a response to a return to near-normal precipitation in much of northern Idaho and western Montana, but to a certain extent the result of effective and timely salvage of infested trees, Douglas-fir beetle (DFB) populations declined in 1989. Aerial survey estimates indicated infested area decreased by approximately 4,000 acres, while trees killed actually increased by 10,000 trees (Table 14). Those faded trees, however, were ones attacked in 1988, or in some cases prior to that. Ground data collected from 44 evaluation plots distributed throughout affected stands showed beetle populations declining in 30 of them. In those 14 plots where parent to brood ratios exceeded 1:1, proportions were only marginally indicative of increasing populations. Only on the Nez Perce NF were population trends static--indicating the possibility of remaining at the same level as in 1989. In every other area sampled, data suggest trends are decreasing (Table 15, Appendix Figures 11, 13, 14, 15).

The most severely affected areas in north Idaho remain on the Wallace and Fernan RD's, IPNF's. There, more than 3,800 acres and 2,500 acres, respectively, showed some level of infestation (Appendix, Figure 12). Though brood samples there show a decidedly declining trend, the prevalence of root disease in many of those stands result in even relatively high endemic beetle populations. Additional drought relief, salvage and the short-lived nature of DFB outbreaks should ensure a continuing decline in beetle trend in 1990. The very conditions of many Douglas-fir stands throughout northern Idaho, however, foster the potential for DFB outbreaks following any type of disturbance.

In 1989, we implemented "bait and cut" strategies, using DFB pheromone tree baits, to concentrate beetles in stands scheduled for harvest in three Districts in northern Idaho. Stands on the St. Maries RD, IPNF's, and North Fork RD, Clearwater NF, were baited and harvested operationally. On the Fernan RD, IPNF's, a replicated project was installed. Results showed baited stands had new attacks at 10 to 21 times the attack rate for nearby, infested, but unbaited stands.

The area most heavily impacted in western Montana was the Willow Creek drainage northwest of Dillon, Dillon RD, Beaverhead NF. There, more than 5,000 acres showed noticeable amounts of beetle-killed trees. We were unable to ground check those stands, but there was much damage attributable to winter drying, as well as former spruce budworm defoliation in that same area. Though beetle-caused mortality appeared to be widespread, it was not especially intense. Infestation intensity was estimated to be less than one tree per acre. Lack of ground-collected data prevents us from predicting the course of that infestation. We will monitor that population in 1990.

On the Bitterroot NF, infested area declined in 1989. The Lolo NF showed a nearly static trend compared to 1988 (Appendix, Figure 10).

Table 14.--Acres infested and mortality attributed to Douglas-fir in the Northern Region by reporting area, 1988 and 1989.

	- - - 1988 - - -			- - - 1989 - - -		
Reporting area	Acres	Trees	Vol. (MBF)	Acres	Trees	Vol. (MBF)
Beaverhead NF	621	440	88.0	5,180	3,528	705.6
Bitterroot	881	1,866	373.2	230	1,243	248.6
Idaho Panhandle NF's	8,888	23,023	8,058.0	10,917	42,218	14,776.3
Clearwater NF	4,780	11,899	4,164.6	1,686	7,014	2,454.9
Custer NF	0	0	0	2	15	3.0
Deerlodge NF	1	5	1.0	22	11	2.2
Flathead NF	110	112	22.4	26	54	10.8
Gallatin NF	1	5	1.0	0	0	0
Helena NF	18	20	4.0	1	10	2.0
Kootenai NF	1,020	1,468	293.6	102	440	88.0
Lewis & Clark NF	1	5	1.0	5	22	4.4
Lolo NF	664	1,485	297.0	712	2,944	588.8
Nez Perce NF	359	1,789	626.1	1,755	6,426	2,249.1
Swan River SF	40	174	34.8	0	0	0
Nez Perce IR	0	0	0	70	210	73.5
Flathead IR	10	91	18.2	7	57	11.4
Rocky Boy's IR	*	*	*	0	0	0
Thompson River SF	1	5	1.0	7	83	16.6
Priest Lake FPD	5,998	8,725	3,053.7	3	45	15.7
Pend Oreille FPD	575	1,536	537.6	212	1,288	450.8
Mica FPD	157	1,264	442.4	79	549	192.2
Cataldo FPD	479	1,862	207.2	244	775	271.2
W. St. Joe FPD	292	719	251.7	363	1,900	665.0
Kendrick FPD	16	160	56.0	5	50	17.5
CLW/Potlatch FPD	2,215	5,162	1,806.7	736	2,924	1,023.4
Maggie Cr. FPD	25	184	64.4	33	320	112.0
Craig Mtns.	10	115	40.3	573	481	168.4
Garnets (BLM)	20	56	11.2	1	9	1.8
Total	27,182	62,134	20,455.1	22,971	72,616	24,153.2

* Not flown in 1988

Table 15.--Average number of Douglas-fir attacked by Douglas-fir beetle, selected plots (44) throughout infested area in northern Idaho and western Montana, 1989.

Location	1988 Dead	1989 Successful attack	1989 Unsuccess-ful attack	Total Dead per plot	Trend
Bitterroot NF	59.3	0.5	1.2	59.8	Decreasing
Clearwater NF	19.2	3.5	4.2	22.7	Decreasing
IPNFs (CDA)	34.2	3.0	1.6	37.2	Decreasing
IPNFs (Kaniksu)	26.0	2.0	4.7	28.0	Decreasing
IPNFs (St. Joe)	26.5	4.1	2.3	30.6	Static to decreasing
Kootenai NF	23.0	0.7	3.0	23.7	Decreasing
Nez Perce NF	16.7	6.2	4.2	22.9	Static

WESTERN PINE BEETLE

Despite improved moisture conditions in northern Idaho, much of the area south of the St. Joe River remained drier than normal in 1989. As a result, many bark beetle population trends inversely followed that pattern. In the north, where moisture was generally improved, beetle populations typically declined. Such was not always the case, however, in the southern half of northern Idaho. That was particularly true at lower elevations.

Western pine beetle (WPB) unlike MPB and DFB, showed a marked increase in infested area in 1989--especially so in the Craig Mountains and ponderosa pine stands within the Nez Perce NF reporting area. More than 5,200 acres and 3,500 acres, respectively, were infested in those areas. Another 3,000 acres had significant numbers of faders on the Mica SF, west of Coeur d'Alene. Other areas with notable amounts of WPB-caused mortality were 2,100 acres on the Priest Lake RD, IPNF's; 2,000 acres within the Clearwater/ Potlatch FPD; and 1,000 acres on the Nez Perce IR. In total, more than 19,600 acres were infested in Idaho north of the Salmon River (Appendix, Figure 16). Reports from the Intermountain Region (USFS) indicate WPB is also a major forest pest in southern Idaho, as far south as Boise.

In western Montana, populations were static with only about 250 total acres infested. Region-wide, an estimated 32,000 trees were killed in 1988 (1989 faders) by WPB.

WPB populations appear to be more directly related to weather than many other bark beetle species. Where rainfall is more nearly normal, we expect populations to decline. Where dry conditions continue, mortality caused by WPB will likely remain epidemic.

FIR ENGRAVER

The course of the fir engraver (FE) outbreak in northern Idaho followed much the same trend as did WPB. A tremendous increase in infested area was noted between 1988 and 1989--particularly true in the more southern portion of our Region. Nearly a three-fold increase in infested area was observed, up to more than 97,500 acres (Appendix, Figure 17). Slightly more than 96,200 of those acres were in Idaho.

While some large infested groups totalling 1,000-2,000 faded trees and covering several hundred acres were recorded, most FE-caused mortality occurred in widely scattered groups of from 10 to 100 trees throughout much of the grand fir type. Particularly heavily infested were grand fir stands within the Clearwater/Potlatch FPD. Nearly 33,000 infested acres, with an estimated mortality of 45,000 trees, was observed. More than 21,000 acres contained approximately 28,000 dead grand fir on the West St. Joe FPD, generally south of Coeur d'Alene Lake. Another 16,600 acres were infested in the Craig Mountains. Grand fir faders were also noted on more than 5,200 acres on the Mica SF, and 4,600 acres on the Kendrick SF. Other areas in north Idaho were seriously affected by FE, but to a lesser extent. In total, an estimated 133,000 trees were killed in 1988 in northern Idaho.

In western Montana, where grand fir type is not as common, losses to FE were less pronounced. On the Plains/Thompson Falls RD, slightly more than 1,100 acres contained scattered groups of dead grand fir. In all of Montana, 1,334 acres were recorded infested. Approximately 2,800 trees were killed.

Not entirely like WPB populations, FE trends are dependent on weather to a certain extent, but are also closely associated with root disease-stressed trees. FE populations may respond less slowly to improved moisture conditions.

PINE ENGRAVER

Pine engraver (IPS) populations declined in northern Idaho for the second consecutive year. A slight increase was noted in Montana, but infested acres remained relatively low. IPS, overwintering as adults, are more dependent upon favorable spring weather than are some bark beetle species. Warm, dry weather and a sufficient supply of host material--either downed or severely weakened--enable them to produce healthy spring broods. A generally cool, wet spring in 1989 no doubt contributed to fewer losses to IPS in low elevation ponderosa pine stands. In Idaho, just over 6,500 trees were killed on approximately 3,300 acres. Most mortality was observed on the Mica SF and within the west St. Joe FPD. In Montana, only 544 acres were infested--nearly half noted on the Kings Hill RD, Lewis and Clark NF. An estimated 1,700 trees were killed.

Adequate spring moisture, attention to proper slash treatment, and timely salvage of infested trees, will almost always result in fewer problems with IPS. All things considered, it is one of the easier bark beetles to manipulate to our advantage.

WESTERN BALSAM BARK BEETLE

Subalpine fir mortality attributed to western balsam bark beetle (WBBB) expanded to nearly 1,900 acres in 1989. Though that represented a marked increase from 1988 levels, populations are still considered endemic. More than 1,700 of those infested acres were recorded in Montana. The Gallatin NF reporting area had the single largest amount of land infested--slightly more than 220 acres.

In north Idaho, the expanded range of the balsam woolly adelgid has resulted in some difficulty in determining the cause of death of subalpine fir in some high elevation stands. For the first time, that pest was recorded in Montana in 1989 (Gast, et al. 1990).

For some time we have supposed that WBBB is but one of a complex of factors contributing to subalpine fir mortality Region-wide. Root diseases, other bark beetles and perhaps balsam wooly adelgid play a significant role. We will attempt to ground check additional stands in 1990 in an effort to more accurately determine causes of tree death. Though not always a valuable timber species, subalpine fir is an important component of stands critically needed for wildlife, watershed protection and aesthetic values.

SPRUCE BEETLE

Spruce beetle (SB) remained at endemic levels Region-wide in 1989. A small group of faded spruce on almost 250 acres was observed in the southwestern portion of the Salmon River RD, Nez Perce NF. Though only an estimated 200 trees were killed, this infestation could be part of a larger outbreak on the Payette NF to the south. That epidemic has existed for several years and should soon start to decline. No additional SB outbreaks of note were recorded.

ACKNOWLEDGEMENTS

Once again, we collectively thank those who contributed much time and effort in compiling the data on which this report is based. Without the assistance of aerial observers, ground surveyors, data managers, typists and many others, our attempts to disseminate information regarding bark beetle conditions would be futile. Our appreciation is extended to all.

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APPENDIX

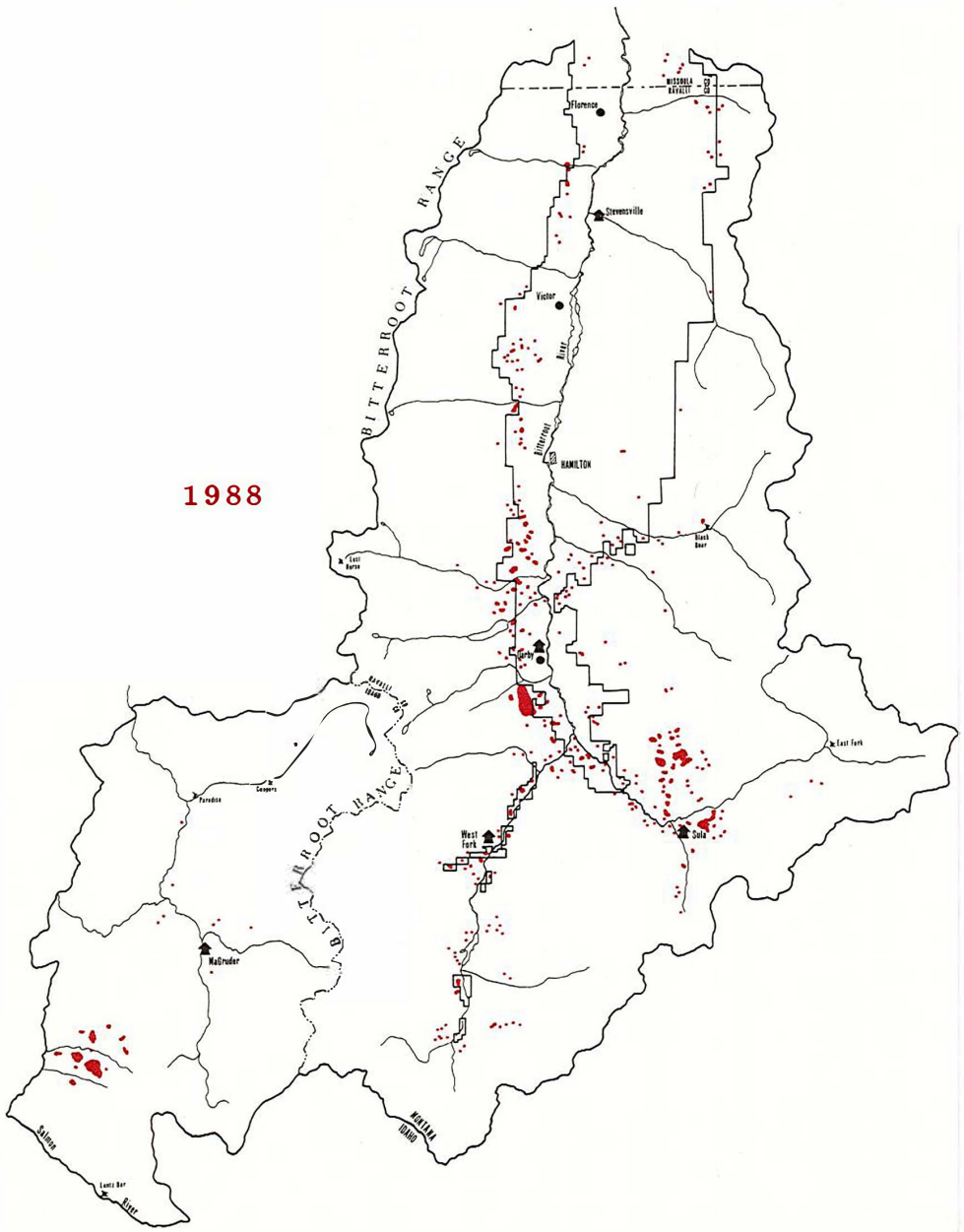
SCIENTIFIC NAMES

Beetles

Mountain pine beetle	*Dendroctonus ponderosae* Hopkins
Douglas-fir beetle	*Dendroctonus pseudotsugae* Hopkins
Pine engraver	*Ips pini* Say
Fir engraver	*Scolytus ventralis* LeConte
Western pine beetle	*Dendroctonus brevicomis* LeConte
Spruce beetle	*Dendroctonus rufipennis (Kirby)*
Western balsam bark beetle	*Dryocoetes confusus* Swaine

Hosts

Lodgepole pine	*Pinus contorta* var. *latifolia* Englemann
Ponderosa pine	*Pinus ponderosa* Laws
Western white pine	*Pinus monticola* Douglas
Whitebark pine	*Pinus albicaulis* Engelmann
Limber pine	*Pinus felxilis* James
Douglas-fir	*Pseudotsuga menziesii* var. *glauca* (Beissn.) Franco
Grand fir	*Abies grandis* (Douglas) Lindl.
Subalpine fir	*Abies lasiocarpa* (Hook.) Nutt.
Engelmann spruce	*Picea engelmannii* Parry



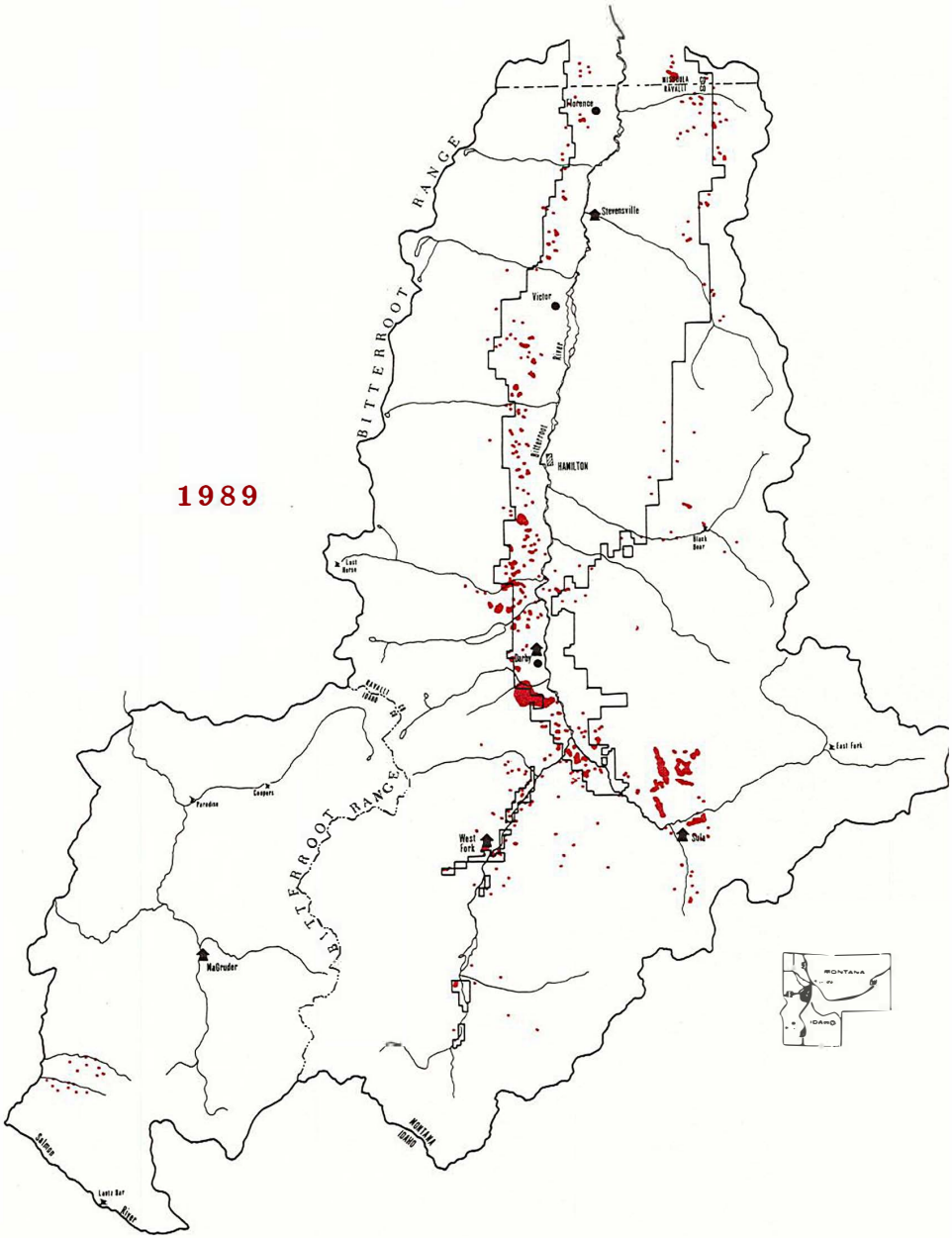


Figure 1.--Areas of pines infested by mountain pine beetle, Bitterroot National Forest area, Idaho and Montana.

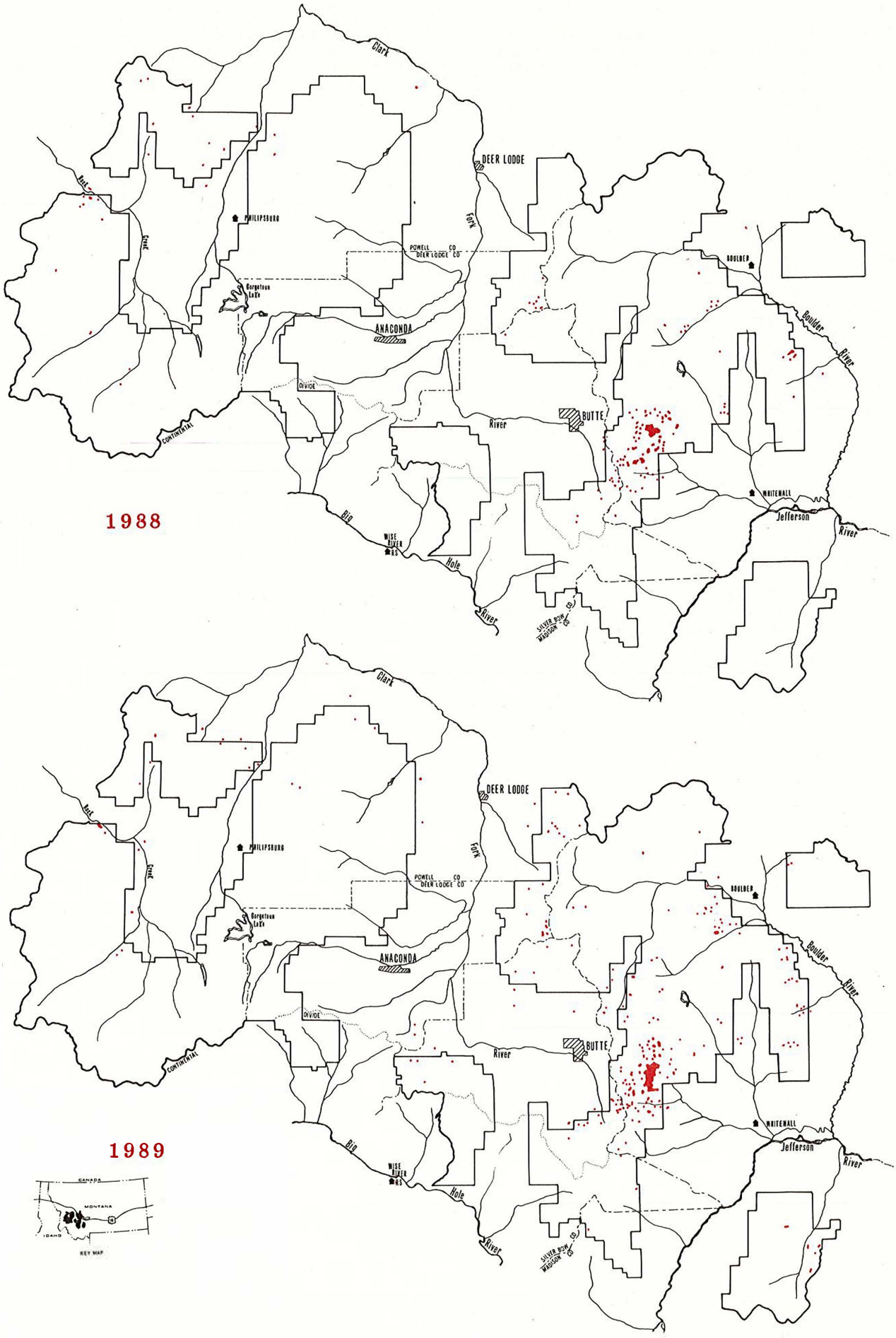


Figure 2.--Areas of pines infested by mountain pine beetle, Deerlodge National Forest area, Montana.

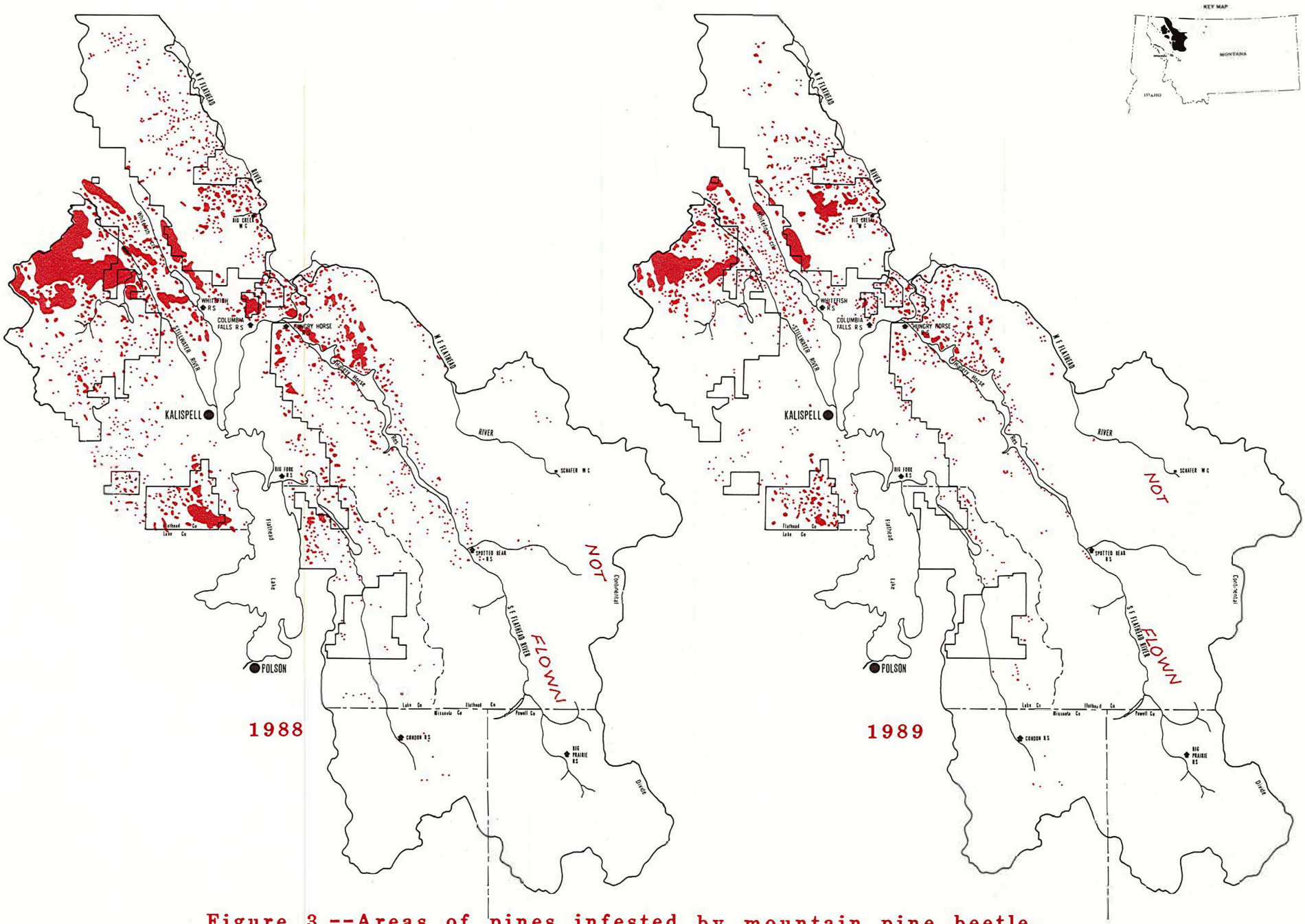


Figure 3.--Areas of pines infested by mountain pine beetle, Flathead National Forest area, Montana.

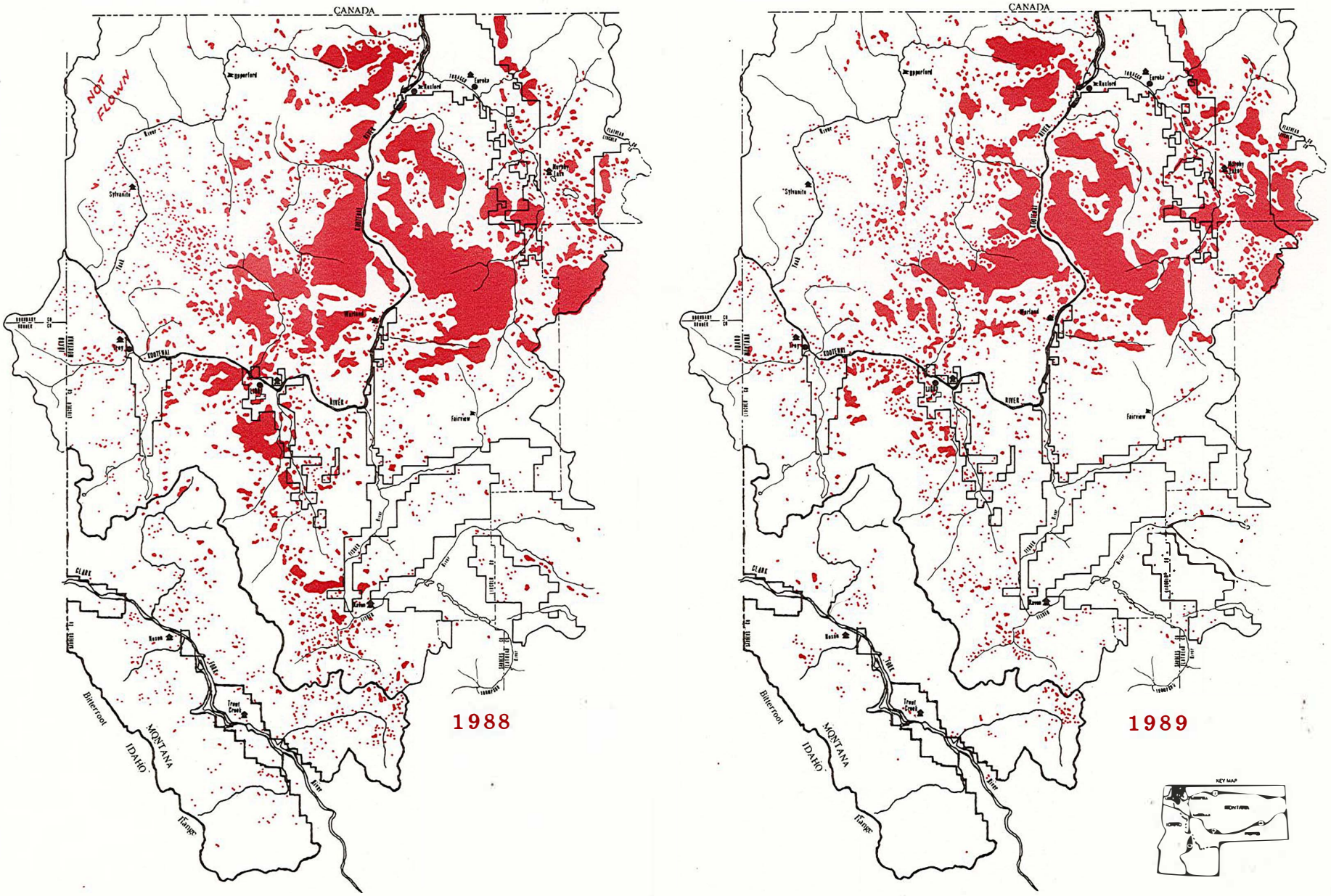


Figure 4.--Areas of pines infested by mountain pine beetle, Kootenai National Forest area, Montana.

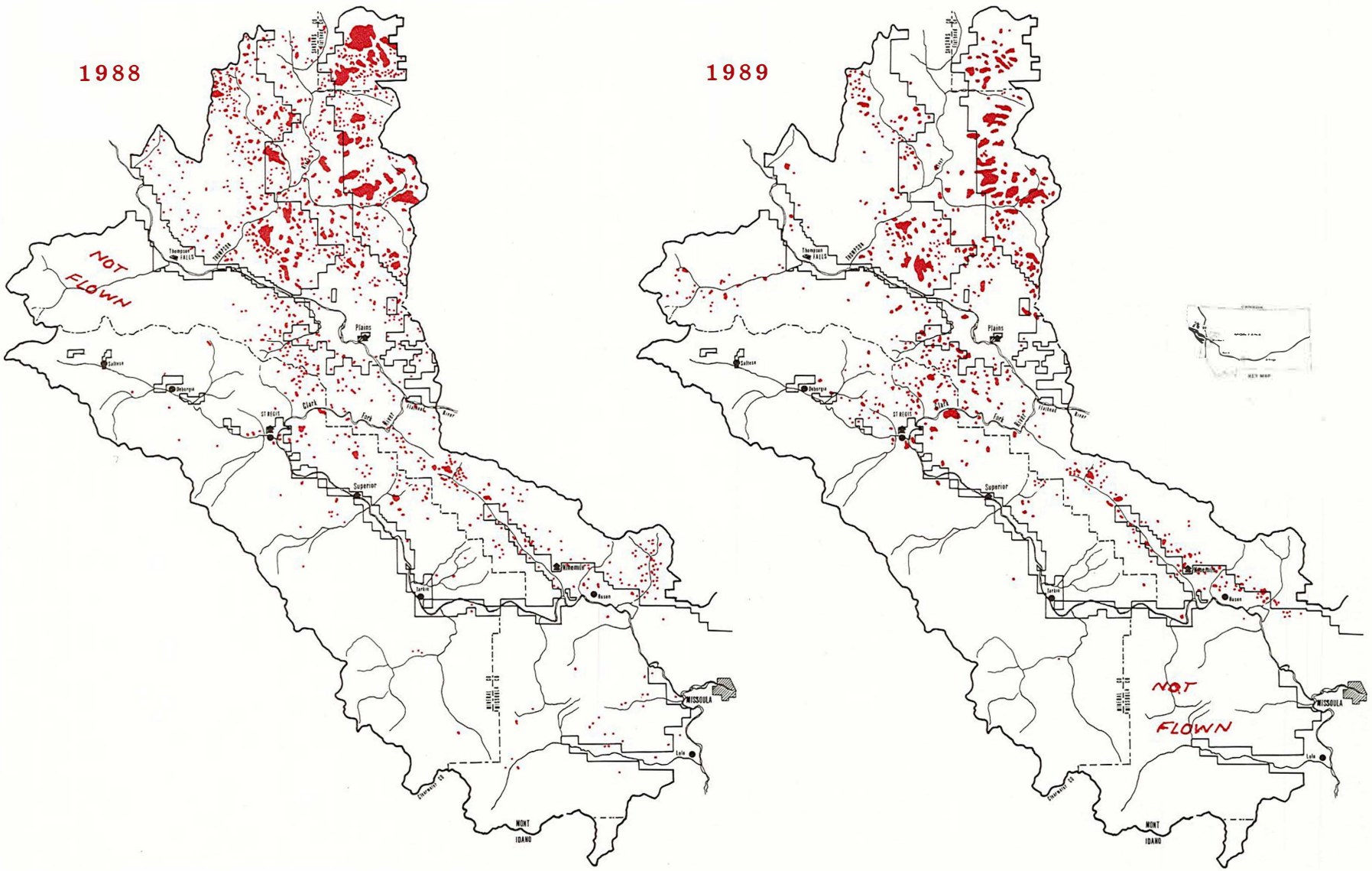


Figure 5.--Areas of pines infested by mountain pine beetle, Lolo National Forest area(west half), Montana.

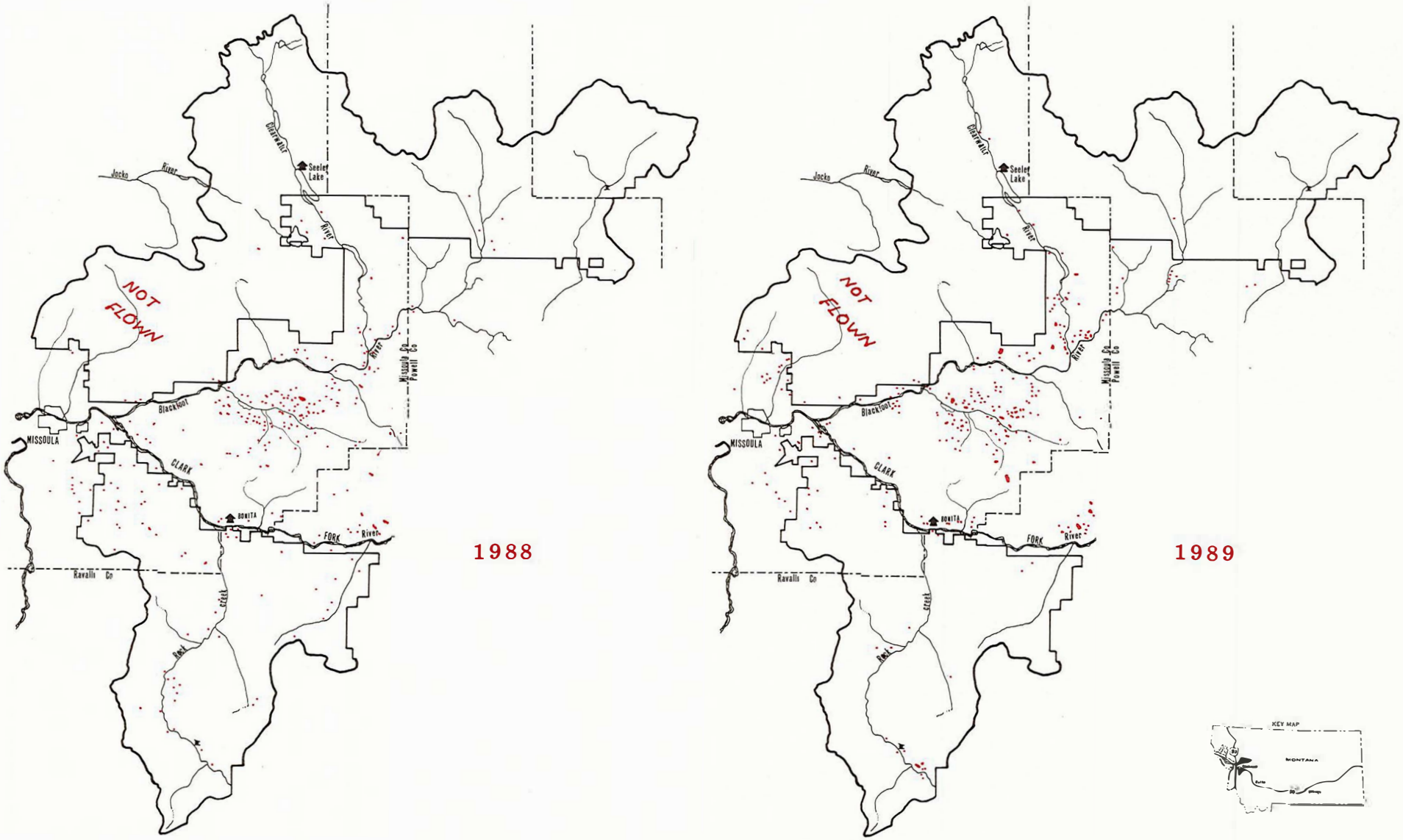


Figure 6.--Areas of pines infested by mountain pine beetle, Lolo National Forest area(east half), Montana.

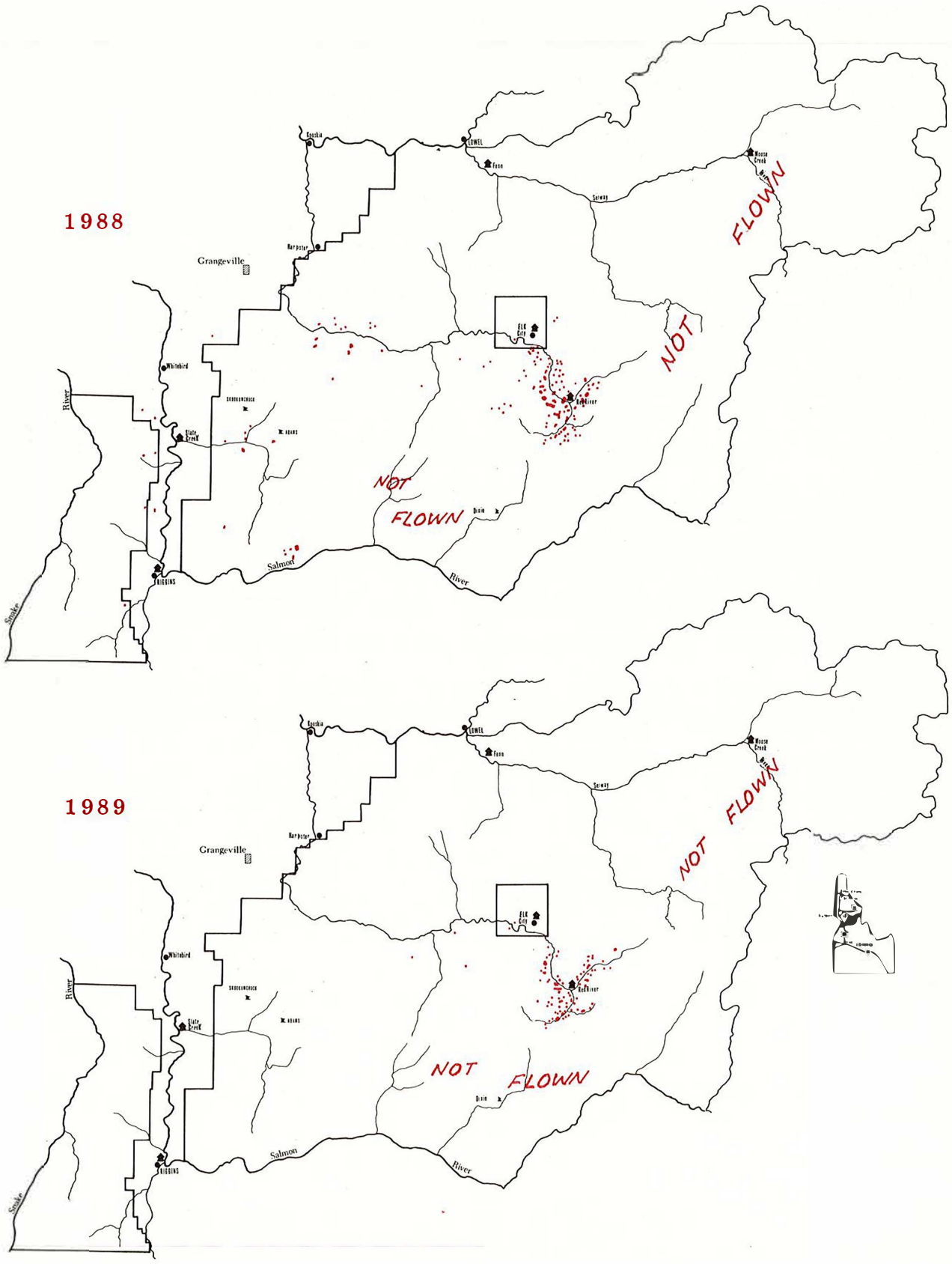


Figure 7.--Areas of pines infested by mountain pine beetle, Nezperce National Forest area, Idaho.

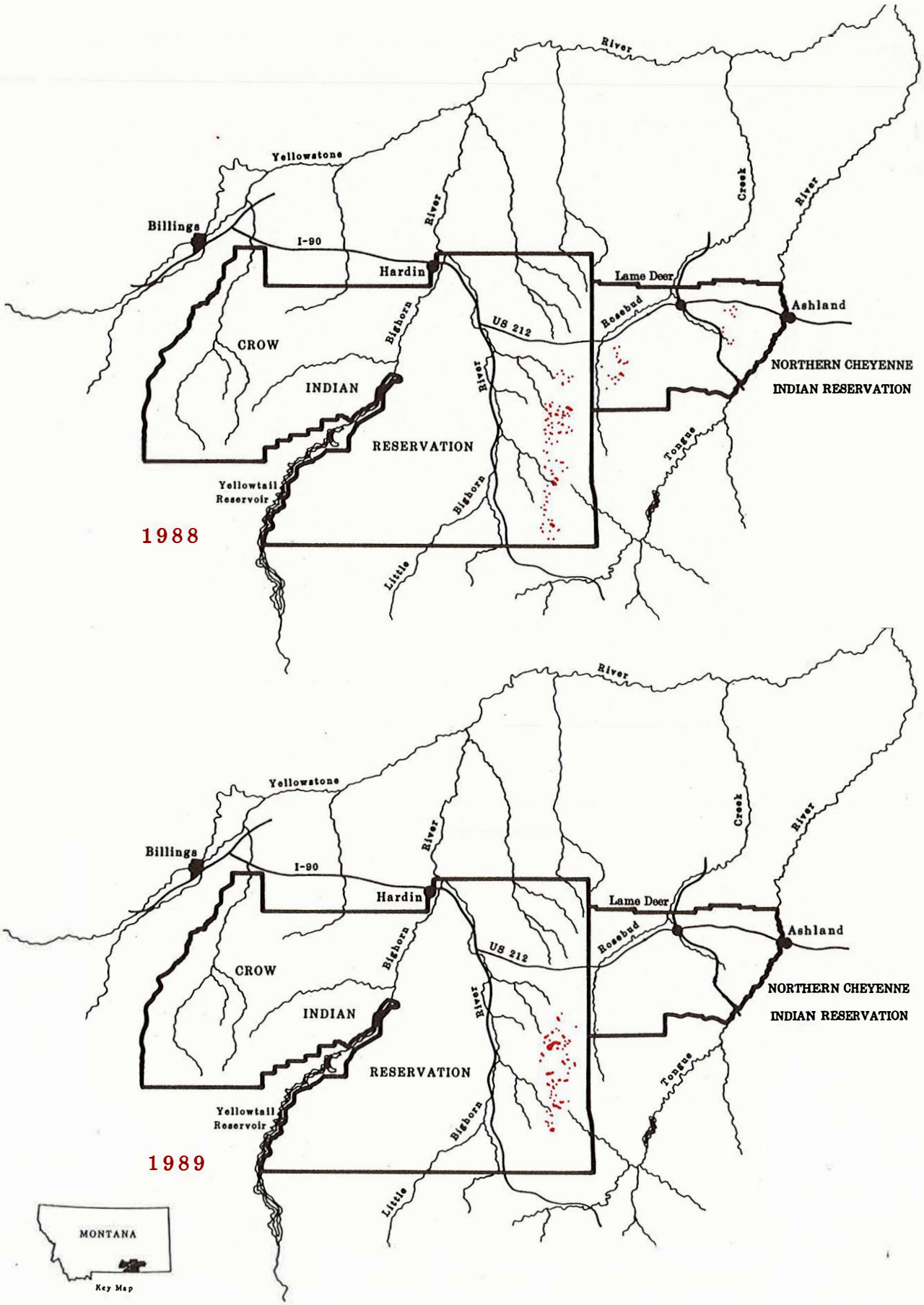


Figure 8.--Areas of pines infested by mountain pine beetle, Crow and Northern Cheyenne Indian Reservations, Montana.

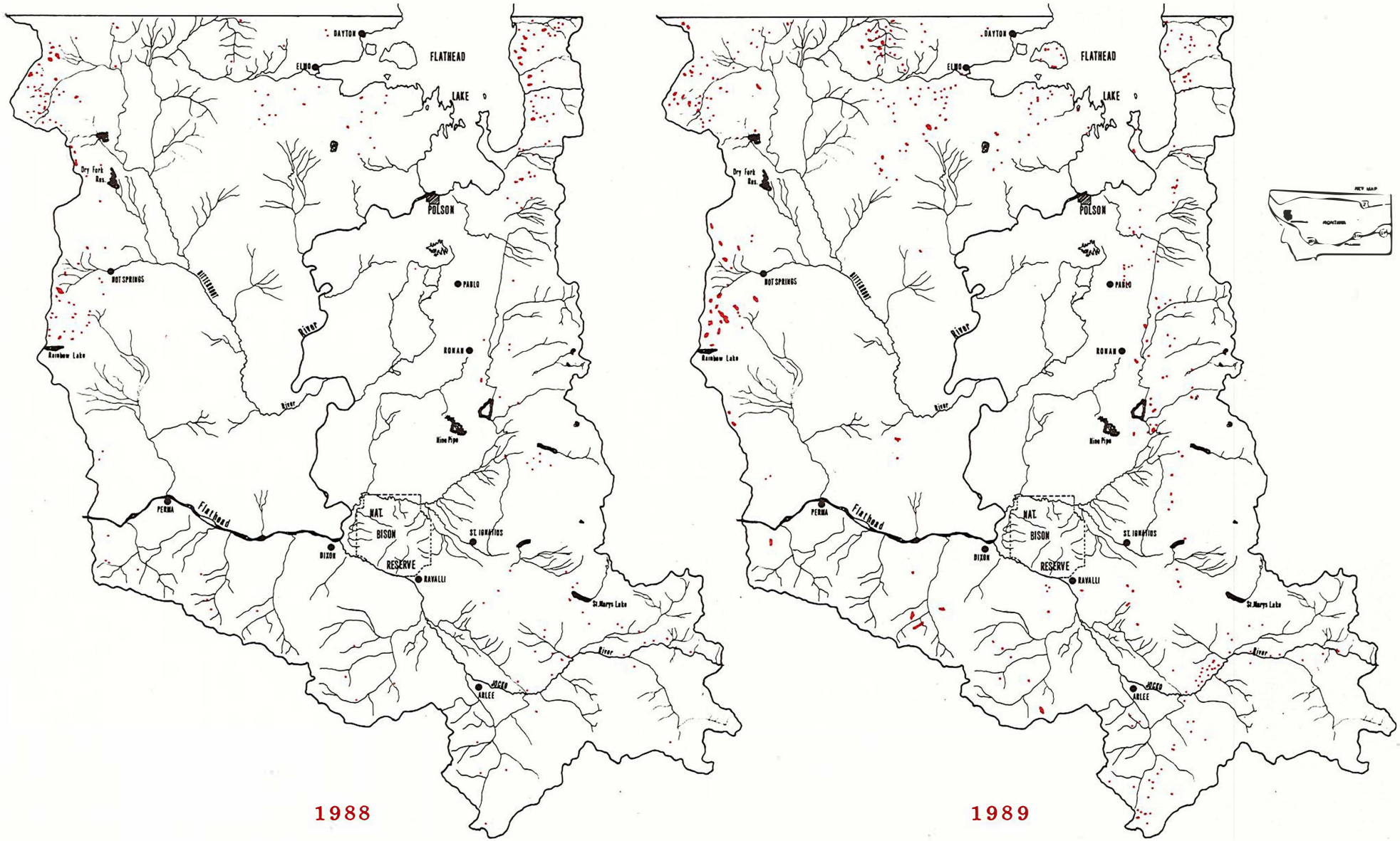


Figure 9.--Areas of pines infested by mountain pine beetle, Flathead Indian Reservation, Montana.

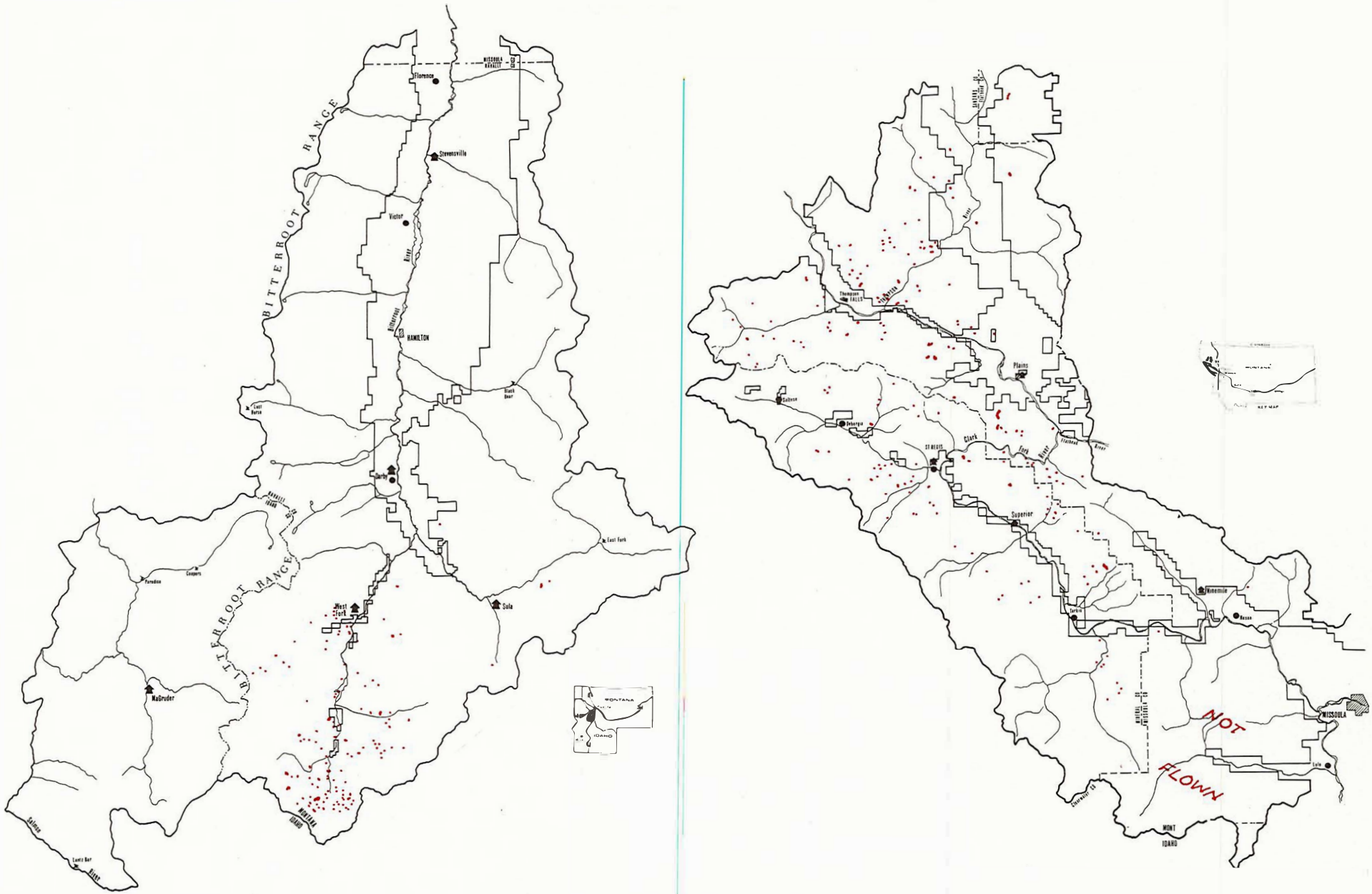


Figure 10.--Areas of Douglas-fir infested by Douglas-fir beetle, Bitterroot National Forest area, Idaho and Montana, and Lolo National Forest area(west half), Montana.

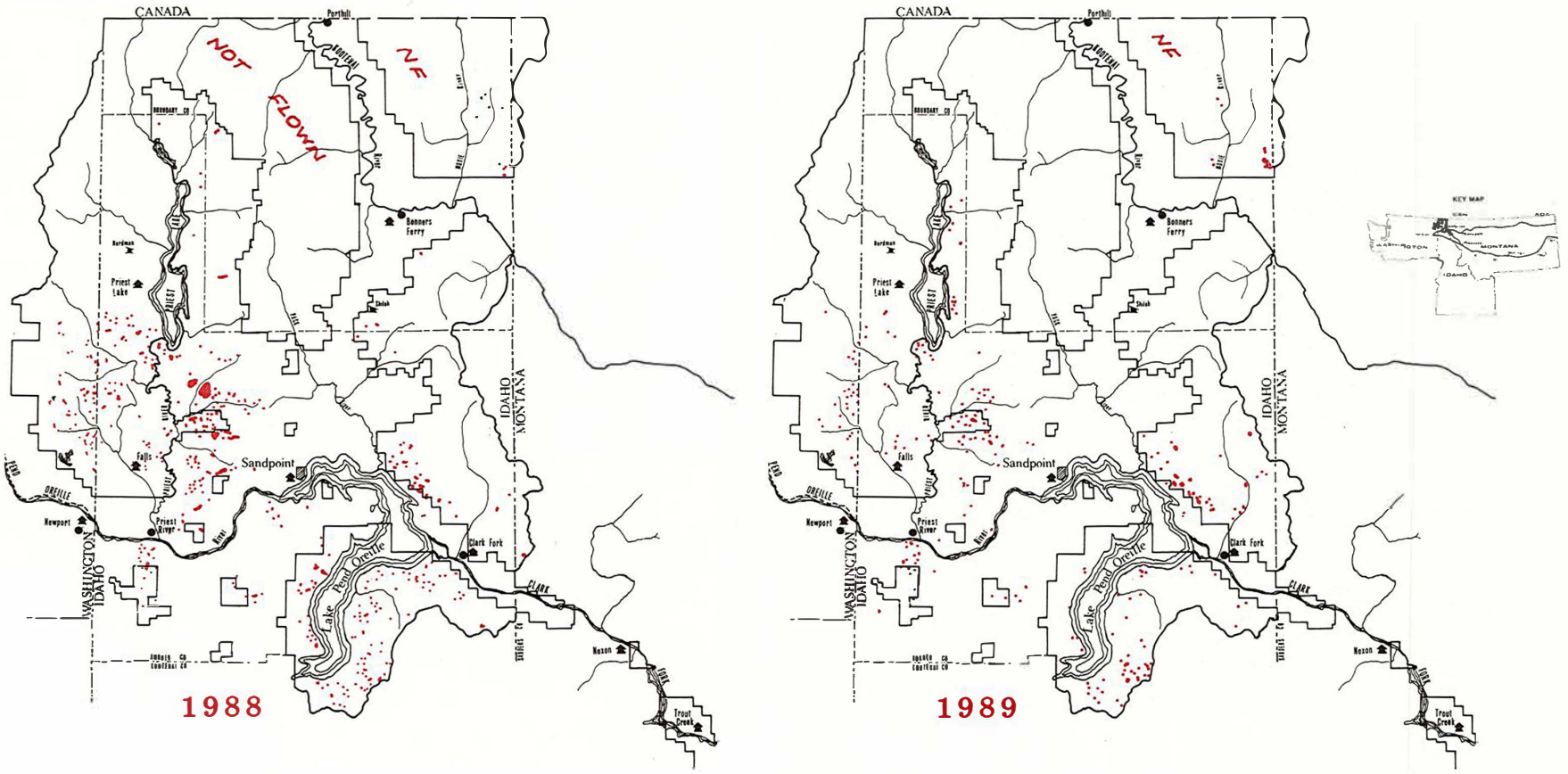
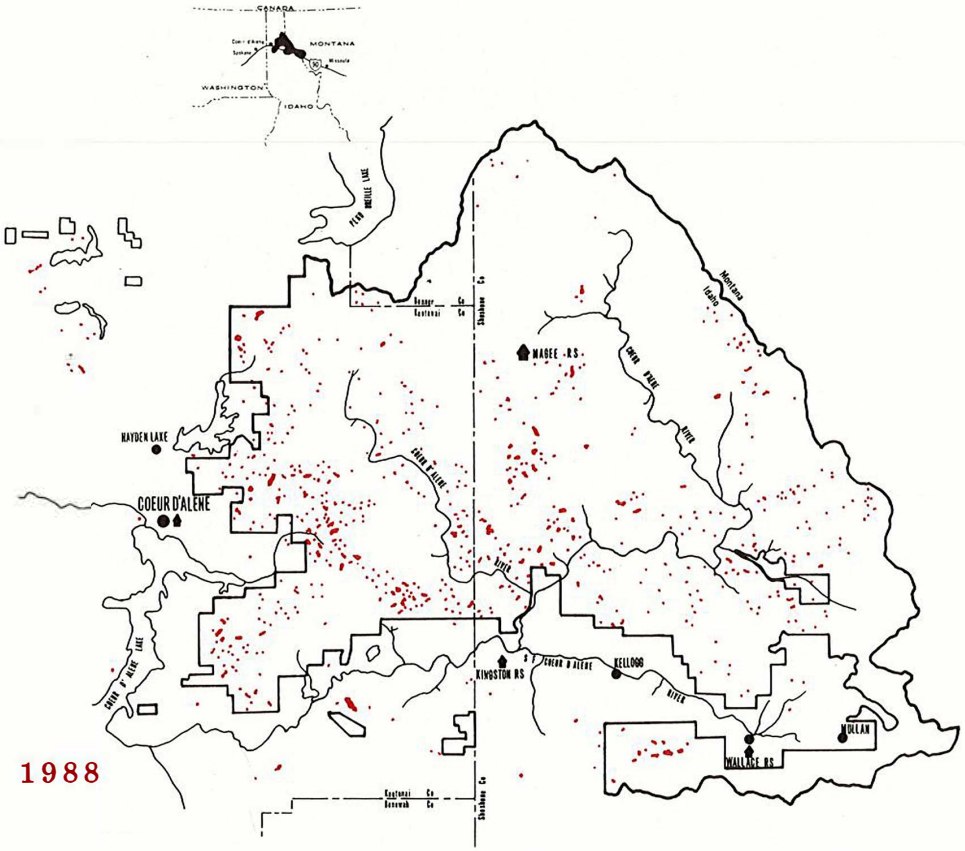


Figure 11.--Areas of Douglas-fir infested by Douglas-fir beetle, Idaho Panhandle National Forests (Kaniksu NF) area, Idaho.



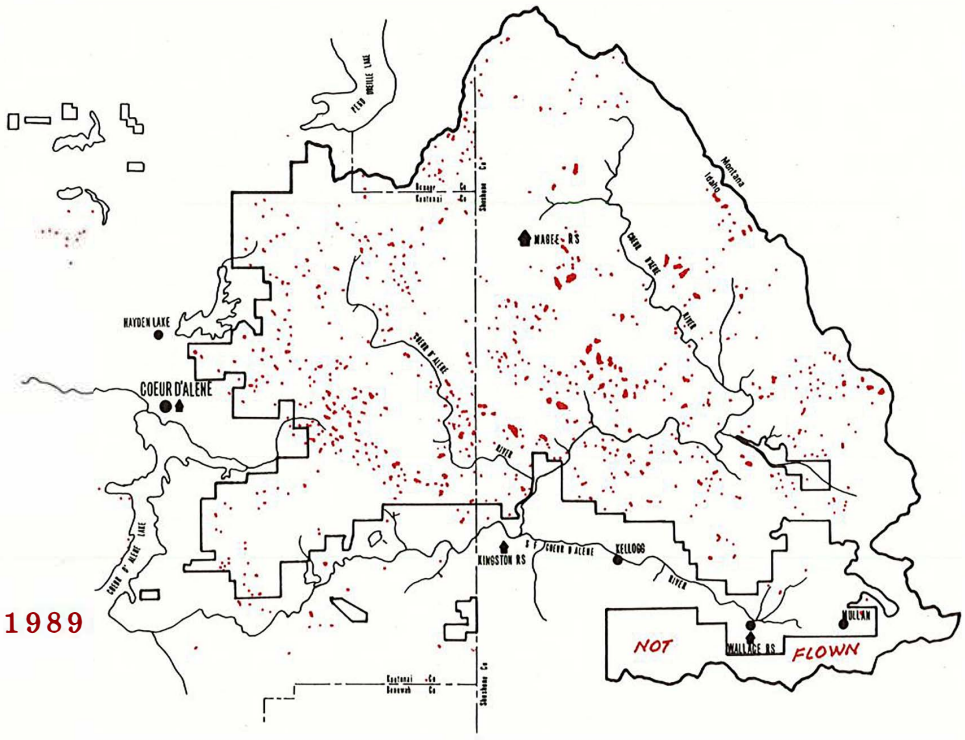
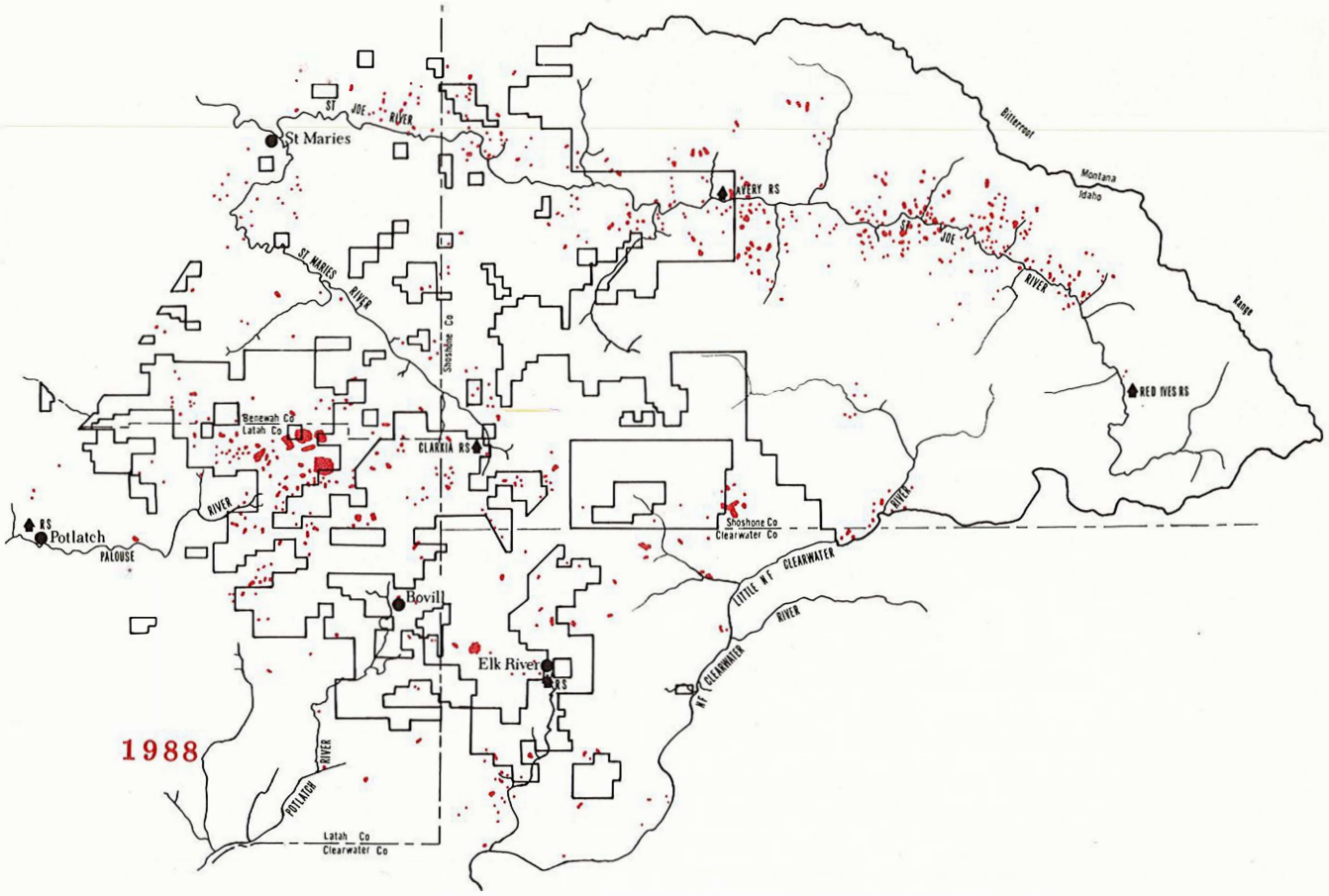


Figure 12.--Areas of Douglas-fir infested by Douglas-fir beetle, Idaho Panhandle National Forests (Coeur d' Alene NF) area, Idaho.



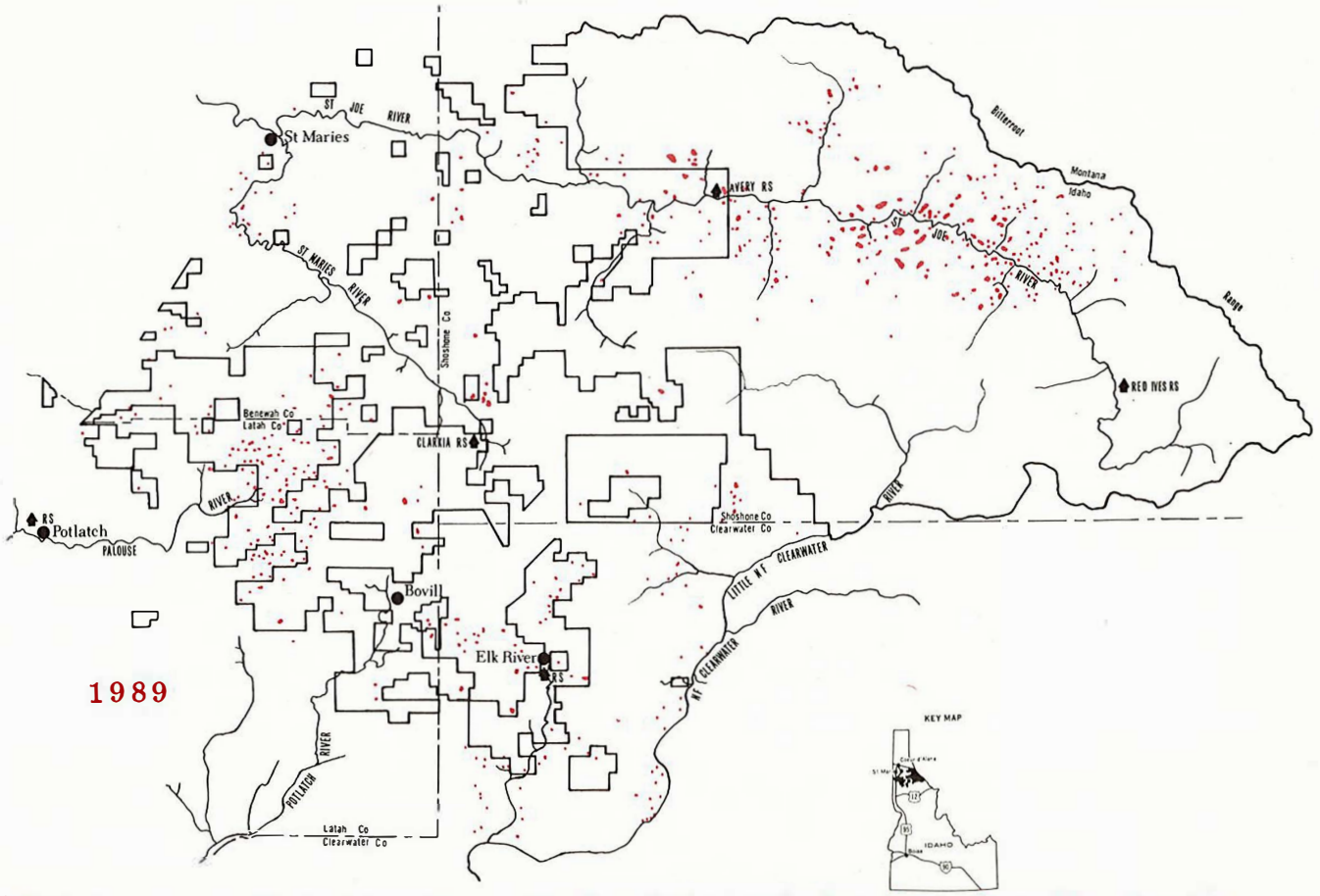


Figure 13.--Areas of Douglas-fir infested by Douglas-fir beetle, Idaho Panhandle National Forests (St. Joe NF) area, Idaho.

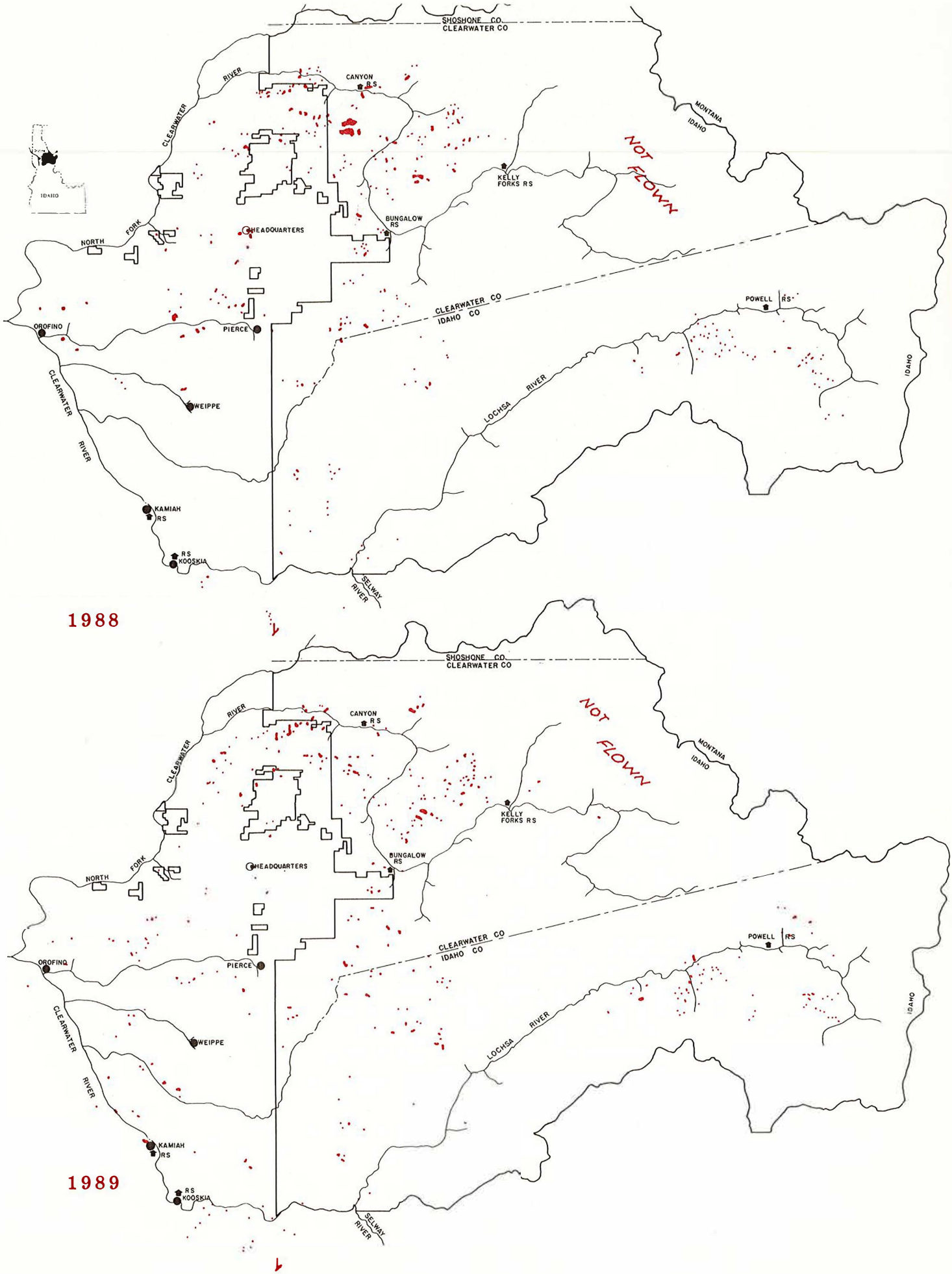


Figure 14.--Areas of Douglas-fir infested by Douglas-fir beetle, Clearwater National Forest area, Idaho.

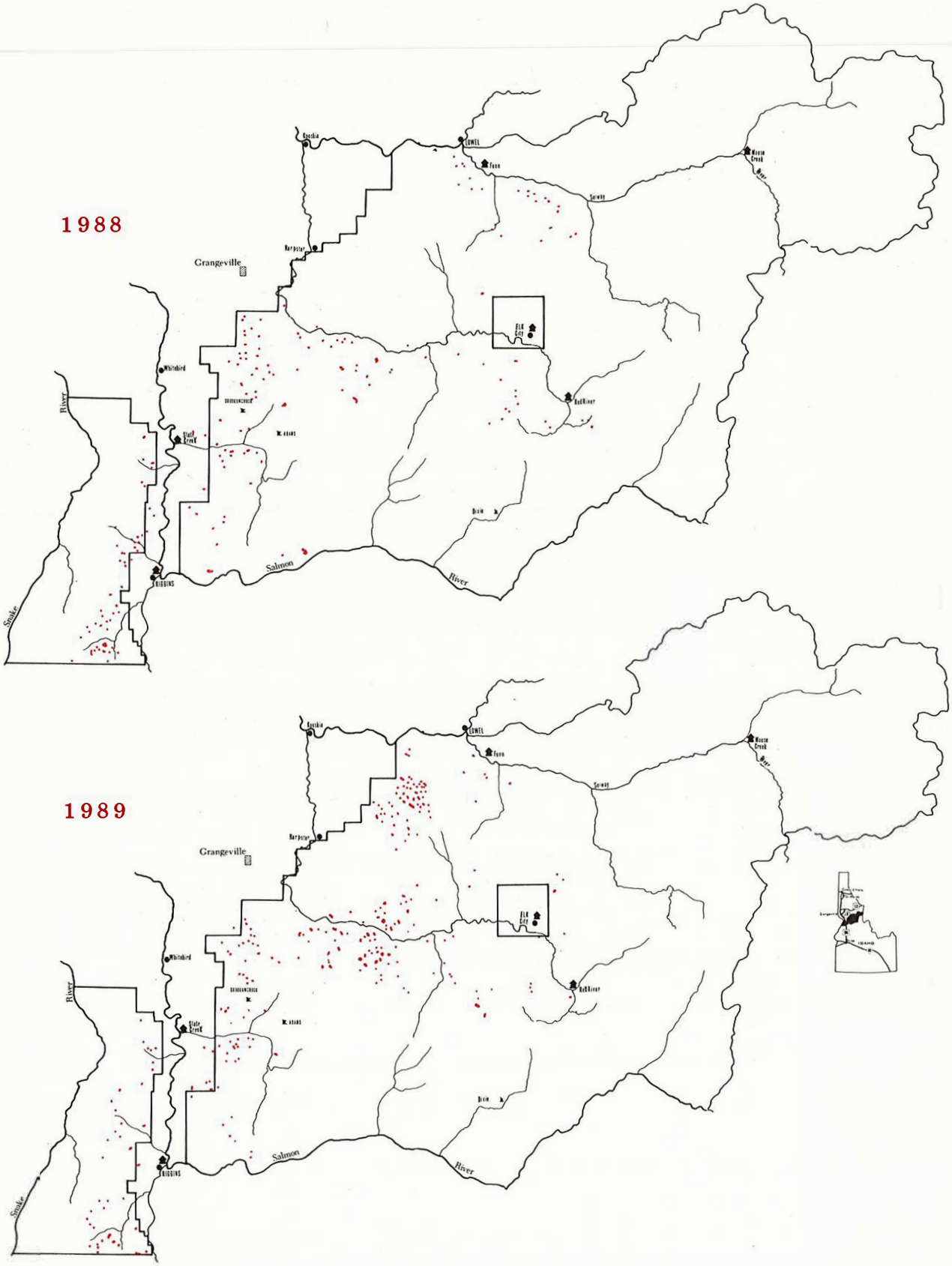


Figure 15.--Areas of Douglas-fir infested by Douglas-fir beetle, Nezperce National Forest area, Idaho.

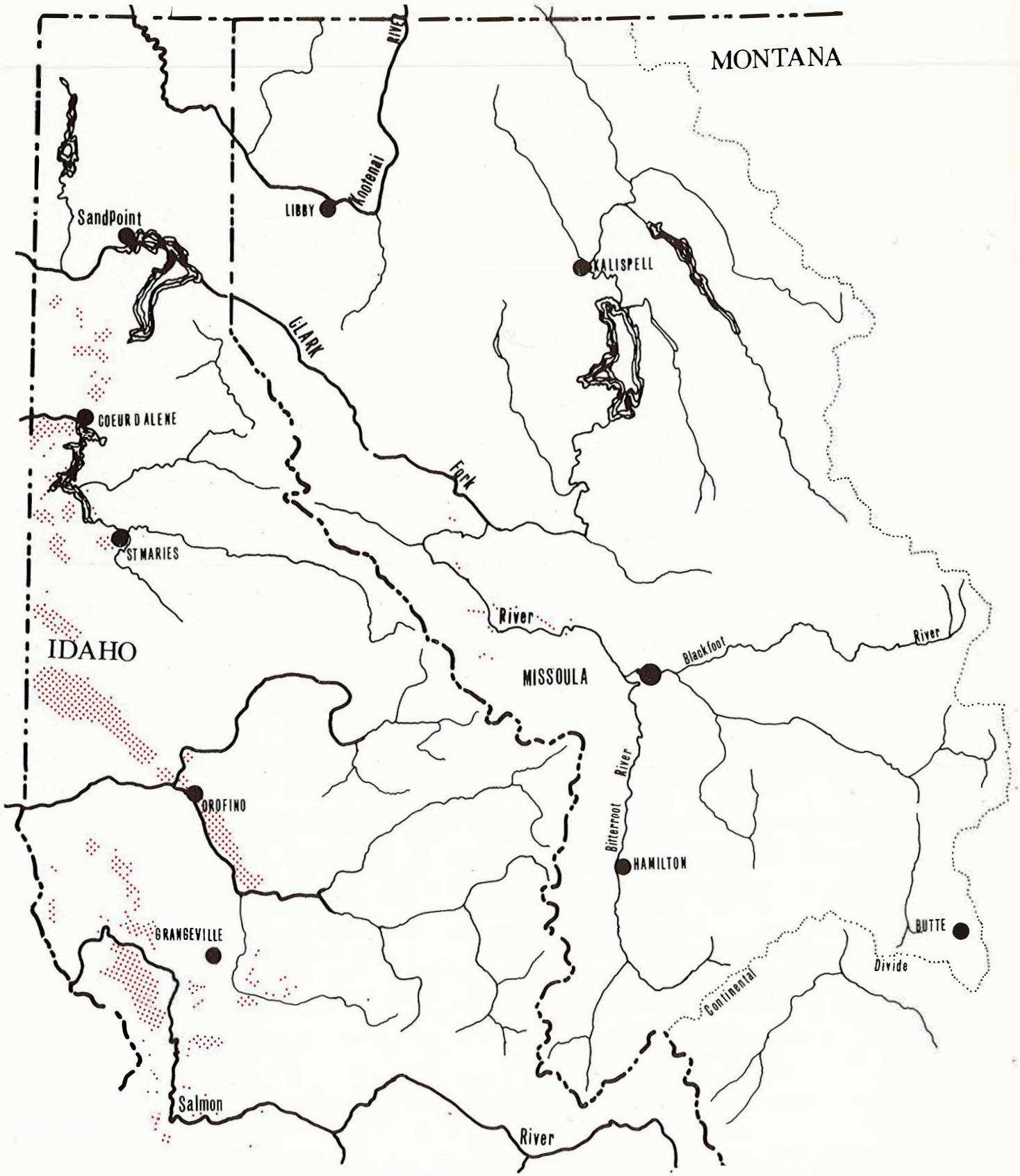


Figure 16.--Areas of pines infested by western pine beetle, northern Idaho and western Montana.

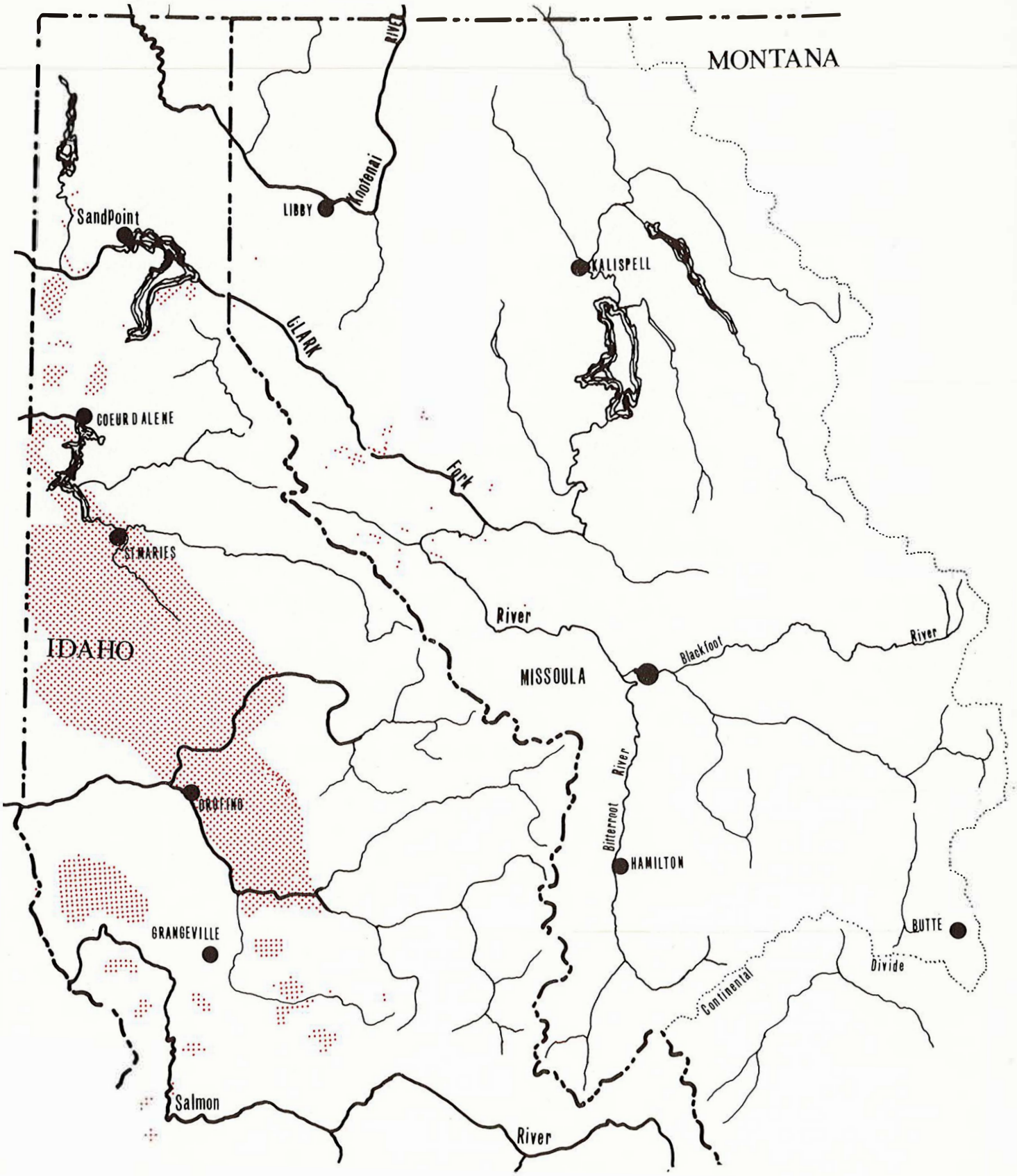


Figure 17.--Areas of grand fir infested by fir engraver beetle, northern Idaho and western Montana.